

Highest Paying Jobs That Require A Four-Year College Degree

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*Data Compiled from the Federal Government's Bureau of Labor Statistics
for the Year 2002 by Resumagic.com*

Significant Points

- The best opportunities for jobs will be with the regional airlines and business aviation.
- Pilots usually start with smaller commuter and regional airlines to acquire the experience needed to qualify for higher paying jobs with national airlines.
- Most pilots traditionally have learned to fly in the military, but growing numbers have college degrees with flight training from civilian flying schools that are certified by the Federal Aviation Administration (FAA).

Nature of the Work

Pilots are highly trained professionals who fly airplanes and helicopters to carry out a wide variety of tasks. Most are **airline pilots, copilots, and flight engineers** who transport passengers and cargo, but 1 out of 5 pilots is a **commercial pilot** involved in more unusual tasks, such as dusting crops, spreading seed for reforestation, testing aircraft, flying passengers and cargo to areas not served by regular airlines, directing firefighting efforts, tracking criminals, monitoring traffic, and rescuing and evacuating injured persons.

Except on small aircraft, two pilots usually make up the cockpit crew. Generally, the most experienced pilot, the captain, is in command and supervises all other crew members. The pilot and the co-pilot, often called the first officer, share flying and other duties, such as communicating with air traffic controllers and monitoring the instruments. Some large aircraft have a third pilot—the flight engineer—who assists the other pilots by monitoring and operating many of the instruments and systems, making minor in-flight repairs, and watching for other aircraft. New technology can perform many flight tasks, however, and virtually all new aircraft now fly with only two pilots, who rely more heavily on computerized controls.

Before departure, pilots plan their flights carefully. They thoroughly check their aircraft to make sure that the engines, controls, instruments, and other systems are functioning properly. They also make sure that baggage or cargo has been loaded correctly. They confer with flight dispatchers and aviation weather forecasters to find out about weather conditions en route and at their destination. Based on this information, they choose a route, altitude, and speed that will provide the fastest, safest, and smoothest flight. When flying under instrument flight rules—procedures governing the operation of the aircraft when there is poor visibility—the pilot in command, or the company dispatcher, normally files an instrument flight plan with air traffic control so that the flight can be coordinated with other air traffic.

Takeoff and landing are the most difficult parts of the flight, and require close coordination between the pilot and first officer. For example, as the plane accelerates for takeoff, the pilot concentrates on the runway while the first officer scans the instrument panel. To calculate the speed they must attain to become airborne, pilots consider the altitude of the airport, outside temperature, weight of the plane, and speed and direction of the wind. The moment the plane reaches takeoff speed, the first officer informs the pilot, who then pulls back on the controls to raise the nose of the plane.

Unless the weather is bad, the actual flight is relatively easy. Airplane pilots, with the assistance of autopilot and the flight management computer, steer the plane along their planned route and are monitored by the air traffic control stations they pass along the way. They regularly scan the instrument panel to check their fuel supply, the condition of their engines, and the air-conditioning, hydraulic, and other systems. Pilots may request a change in altitude or route if circumstances dictate. For example, if the ride is rougher than expected, they may ask air traffic control if pilots flying at other altitudes have reported better conditions. If so, they may request an altitude change. This procedure also may be used to find a stronger tailwind or a weaker headwind to save fuel and increase speed.

In contrast, helicopters are used for short trips at relatively low altitude, so pilots must be constantly on the lookout for trees, bridges, power lines, transmission towers, and other dangerous obstacles. Regardless of the type of aircraft, all pilots must monitor warning devices designed to help detect sudden shifts in wind conditions that can cause crashes.

Pilots must rely completely on their instruments when visibility is poor. On the basis of altimeter readings, they know how high above ground they are and whether they can fly safely over mountains and other obstacles. Special navigation radios give pilots precise information that, with the help of special maps, tells them their exact position. Other very sophisticated equipment provides directions to a point just above the end of a runway and enables pilots to land completely "blind." Once on the ground, pilots must complete records on their flight for their organization and the FAA report.

The number of non-flying duties that pilots have depends on the employment setting. Airline pilots have the services of large support staffs, and consequently, perform few non-flying duties. Pilots employed by other organizations such as charter operators or businesses have many other duties. They may load the aircraft, handle all passenger luggage to ensure a balanced load, and supervise refueling; other non-flying responsibilities include keeping records, scheduling flights, arranging for major maintenance, and performing minor aircraft maintenance and repair work.

Some pilots are instructors. They teach their students the principles of flight in ground-school classes and demonstrate how to operate aircraft in dual-controlled planes and helicopters. A few specially trained pilots are "examiners" or "check pilots." They periodically fly with other pilots or pilot's license applicants to make sure that they are proficient.

Working Conditions

By law, airline pilots cannot fly more than 100 hours a month or more than 1,000 hours a year. Most airline pilots fly an average of 75 hours a month and work an additional 75 hours a month performing non-flying duties. Most pilots have a variable work schedule, working several days on, then several days off. Most spend a considerable amount of time away from home because the majority of flights involve overnight layovers. When pilots are away from home, the airlines provide hotel accommodations, transportation between the hotel and airport, and an allowance for meals and other expenses. Airlines operate flights at all hours of the day and night, so work schedules often are irregular. Flight assignments are based on seniority.

Commercial pilots also may have irregular schedules, flying 30 hours one month and 90 hours the next. Because these pilots frequently have many non-flying responsibilities, they have much less free time than do airline pilots. Except for business pilots, most do not remain away from home overnight. They may work odd hours. Flight instructors may have irregular and seasonal work schedules, depending on their students' available time and the weather. Instructors frequently work in the evening or on weekends.

Airline pilots, especially those on international routes, often suffer jet lag—fatigue caused by many hours of flying through different time zones. To guard against excessive pilot fatigue that could result in unsafe flying conditions, the FAA requires airlines to allow pilots at least 8 hours of uninterrupted rest in the 24 hours before finishing their flight duty. The work of test pilots, who check the flight performance of new and experimental planes, may be dangerous. Pilots who are crop dusters may be exposed to toxic chemicals and seldom have the benefit of a regular landing strip. Helicopter pilots involved in rescue and police work may be subject to personal injury.

Although flying does not involve much physical effort, the mental stress of being responsible for a safe flight, regardless of the weather, can be tiring. Pilots must be alert and quick to react if something goes wrong, particularly during takeoff and landing.

Employment

Civilian aircraft pilots and flight engineers held about 100,000 jobs in 2002. About 79,000 worked as airline pilots, copilots, and flight engineers. The remainders were commercial pilots who worked as flight instructors at local airports or for large businesses that fly company cargo and executives in their own airplanes or helicopters. Some commercial pilots flew small planes for air-taxi companies, usually to or from lightly traveled airports not served by major airlines. Others worked for a variety of businesses, performing tasks such as dusting crops, inspecting pipelines, or conducting sightseeing trips. Federal, State, and local governments also employed pilots. A few pilots were self-employed.

Pilots are located across the country, but airline pilots usually are based near major metropolitan airports or airports operating as hubs for the major airlines.

Training, Other Qualifications, and Advancement

All pilots who are paid to transport passengers or cargo must have a commercial pilot's license with an instrument rating issued by the FAA. Helicopter pilots must hold a commercial pilot's certificate with a helicopter rating. To qualify for these licenses, applicants must be at least 18 years old and have at least 250 hours of flight experience. The experience required can be reduced through participation in certain flight school curricula approved by the FAA. Applicants also must pass a strict physical examination to make sure that they are in good health and have 20/20 vision with or without glasses, good hearing, and no physical handicaps that could impair their performance. They must pass a written test that includes questions on the principles of safe flight, navigation techniques, and FAA regulations, and must demonstrate their flying ability to FAA or designated examiners.

To fly during periods of low visibility, pilots must be rated by the FAA to fly by instruments. Pilots may qualify for this rating by having 105 hours of flight experience, including 40 hours of experience in flying by instruments; they also must pass a written examination on procedures and FAA regulations covering instrument flying and demonstrate to an examiner their ability to fly by instruments.

Airline pilots must fulfill additional requirements. Pilots must have an airline transport pilot's license. Applicants for this license must be at least 23 years old and have a minimum of 1,500 hours of flying experience, including night and instrument flying, and must pass FAA written and flight examinations. Usually, they also have one or more advanced ratings, such as multiengine aircraft or aircraft-type ratings, dependent upon the requirements of their particular flying jobs. Because pilots must be able to make quick decisions and accurate judgments under pressure, many airline companies reject applicants who do not pass required psychological and aptitude tests. All licenses are valid so long as a pilot can pass the periodic physical and eye examinations and tests of flying skills required by Federal Government and company regulations.

The U.S. Armed Forces have always been an important source of trained pilots for civilian jobs. Military pilots gain valuable experience on jet aircraft and helicopters, and persons with this experience usually are preferred for civilian pilot jobs. This primarily reflects the extensive flying time military pilots receive. Persons without Armed Forces training may become pilots by attending flight schools or by taking lessons from individual FAA-certified flight instructors. The FAA has certified about 600 civilian flying schools, including some colleges and universities that offer degree credit for pilot training. Over the projection period, trained pilots leaving the military are not expected to increase very much in number as the need for pilots grows in civilian aviation. As a result, FAA-certified schools will train a larger share of pilots than in the past.

Although some small airlines will hire high school graduates, most airlines require at least 2 years of college and prefer to hire college graduates. In fact, most entrants to this occupation have a college degree. Because the number of college educated applicants continues to increase, many employers are making a college degree an educational requirement.

Depending on the type of aircraft, new airline pilots start as first officers or flight engineers. Although some airlines favor applicants who already have a flight engineer's license, they may provide flight engineer training for those who have only the commercial license. Many pilots begin with smaller regional or commuter airlines, where they obtain experience flying passengers on scheduled flights into busy airports in all weather conditions. These jobs often lead to higher paying jobs with bigger, national airlines.

Initial training for airline pilots includes a week of company indoctrination, 3 to 6 weeks of ground school and simulator training, and 25 hours of initial operating experience, including a check-ride with an FAA aviation safety inspector. Once trained and "on the line," pilots are required to attend recurrent training and simulator checks twice a year throughout their career.

Organizations other than airlines usually require less flying experience. However, a commercial pilot's license is a minimum requirement, and employers prefer

applicants who have experience in the type of craft they will be flying. New employees usually start as first officers, or fly less sophisticated equipment. Test pilots often are required to have an engineering degree.

Advancement for all pilots usually is limited to other flying jobs. Many pilots start as flight instructors, building up their flying hours while they earn money teaching. As they become more experienced, these pilots occasionally fly charter planes or perhaps get jobs with small air transportation firms, such as air-taxi companies. Some advance to flying corporate planes. A small number get flight engineer jobs with the airlines.

In the airlines, advancement usually depends on seniority provisions of union contracts. After 1 to 5 years, flight engineers advance according to seniority to first officer and, after 5 to 15 years, to captain. Seniority also determines which pilots get the more desirable routes. In a non-airline job, a first officer may advance to pilot and, in large companies, to chief pilot or director of aviation in charge of aircraft scheduling, maintenance, and flight procedures.

Job Outlook

The passenger airline industry is undergoing many changes, with some airlines posting increases in passenger traffic and adding routes while others are cutting back. Overall, the employment of aircraft pilots is projected to increase about as fast as average for all occupations through 2012. In the long run, demand for air travel is expected to track increases in the population and growth of the economy. In the short run, however, employment of pilots is generally sensitive to cyclical swings in the economy. During recessions, when a decline in the demand for air travel forces airlines to curtail the number of flights, airlines may temporarily furlough some pilots.

After September 11, 2001, air travel was severely depressed. A number of the major airlines were forced to reduce schedules, layoff pilots, and even declare bankruptcy. At the same time, hiring continued at regional and low-fare airlines. It is expected that job opportunities will continue to be better with the regional airlines and low-fare carriers, which are growing faster than the more well-known major airlines. Opportunities with air cargo carriers also are expected to be good due to increasing security requirements for shipping freight on passenger airlines and growth in e-business.

Pilots attempting to get jobs at the major airlines will face strong competition, as those firms tend to attract many more applicants than they have jobs. They also will have to compete with laid off pilots for any available jobs. Pilots who have logged the greatest number of flying hours in the more sophisticated equipment typically have the best prospects. For this reason, military pilots often have an advantage over other applicants. However, prior to September 11, 2001, some airlines reported a shortage of qualified pilots to operate the most sophisticated aircraft. Thus, when hiring improves, jobseekers with the most FAA licenses will have a competitive advantage. Opportunities for pilot jobs should be better at smaller airlines and in corporate travel.

The number of flight engineers is projected to decline through 2012 as new planes needing only two pilots replace older planes that required flight engineers. Pilots also

will experience some productivity improvements as airlines switch to larger planes and adopt the low-fare carrier model that emphasizes faster turnaround times for flights, keeping more pilots in the air rather than waiting on the ground.

Earnings

Earnings of aircraft pilots and flight engineers vary greatly depending whether they work as airline or commercial pilots. Earnings of airline pilots are among the highest in the Nation, and depend on factors such as the type, size, and maximum speed of the plane and the number of hours and miles flown. For example, pilots who fly jet aircraft usually earn higher salaries than do pilots who fly turboprops. Airline pilots and flight engineers may earn extra pay for night and international flights. In 2002, median annual earnings of airline pilots, copilots, and flight engineers were \$109,580. The lowest 10 percent earned less than \$55,800. More than 25 percent earned over \$145,000.

Median annual earnings of commercial pilots were \$47,970 in 2002. The middle 50 percent earned between \$33,830 and \$70,140. The lowest 10 percent earned less than \$26,100, and the highest 10 percent earned more than \$101,460.

Airline pilots usually are eligible for life and health insurance plans financed by the airlines. They also receive retirement benefits and, if they fail the FAA physical examination at some point in their careers, they get disability payments. In addition, pilots receive an expense allowance, or "per diem," for every hour they are away from home. Some airlines also provide allowances to pilots for purchasing and cleaning their uniforms. As an additional benefit, pilots and their immediate families usually are entitled to free or reduced-fare transportation on their own and other airlines.

More than half of all aircraft pilots are members of unions. Most of the pilots who fly for the major airlines are members of the Airline Pilots Association, International, but those employed by one major airline are members of the Allied Pilots Association. Some flight engineers are members of the Flight Engineers' International Association.

Sources of Additional Information

Information about job opportunities, salaries for a particular airline, and qualifications required may be obtained by writing to the personnel manager of the airline. For information on airline pilots, contact:

- Air Line Pilots Association, 533 Herndon Parkway, Herndon, VA 22070.
- Air Transport Association of America, Inc., 1301 Pennsylvania Ave. NW., Suite 1100, Washington, DC 20004.

Significant Points

- General Managers work in private industry and government and have a wide range of responsibilities, experience, earnings, and education.
- Applicants face keen competition due to the substantial supply of competent, experienced workers seeking managerial jobs.

Nature of the Work

General Managers perform a broad range of duties in virtually every sector of the economy. They coordinate and direct support services to organizations as diverse as insurance companies, computer manufacturers, and government offices. These workers manage the many functions that allow organizations to operate efficiently, such as secretarial and reception, administration, payroll, conference planning and travel, information and data processing, mail, materials scheduling and distribution, printing and reproduction, records management, telecommunications management, sales, security, parking, and personal property procurement, supply, and disposal.

Specific duties for these managers vary by degree of responsibility and authority. First-line managers directly supervise a staff that performs various support services. Mid-level managers, on the other hand, develop departmental plans, set goals and deadlines, implement procedures to improve productivity and customer service, and define the responsibilities of supervisory-level managers. Some mid-level managers oversee first-line supervisors from various departments. Mid-level managers also may be involved in the hiring and dismissal of employees, but they generally have no role in the formulation of personnel policy.

In small organizations, a manager may oversee all support services. In larger ones, however, first-line managers often report to mid-level managers who, in turn, report to owners or top-level managers. As the size of the firm increases, managers are more likely to specialize in specific support activities.

General managers who work as facility managers plan, design, and manage buildings and grounds in addition to people. They are responsible for coordinating the physical workplace with the people and work of an organization. This task requires integrating the principles of business administration, architecture, and behavioral and engineering science. Although the specific tasks assigned to facility managers vary substantially depending on the organization, the duties fall into several categories, relating to operations and maintenance, real estate, project planning and management, communication, finance, quality assessment, facility function, technology integration, and management of human and environmental factors. Tasks within these broad categories may include space and workplace planning, budgeting, purchase and sale of real estate, lease management, renovations, or architectural planning and design. Facility managers may suggest and oversee renovation projects for a variety of reasons, ranging from improving efficiency to ensuring that facilities meet government regulations and environmental, health, and security standards. Additionally, facility managers continually monitor the facility to ensure that it

remains safe, secure, and well-maintained. Often, the facility manager is responsible for directing staff, including maintenance, grounds, and custodial workers.

Working Conditions

General managers generally work in comfortable offices. Managers involved in contract administration and personal property procurement, use, and disposal may travel between their home office, branch offices, vendors' offices, and property sales sites. Also, facility managers who are responsible for the design of workspaces may spend time at construction sites and may travel between different facilities while monitoring the work of maintenance, grounds, and custodial staffs. However, new technology has increased the number of managers who telecommute from home or other offices, and teleconferencing has reduced the need for travel.

Most managers work a standard 40-hour week. However, uncompensated overtime frequently is required to resolve problems and meet deadlines. Facility managers often are "on call" to address a variety of problems that can arise in a facility during non-work hours.

Training, Other Qualifications, and Advancement

Educational requirements for general managers vary widely, depending on the size and complexity of the organization. In small organizations, experience may be the only requirement needed to enter a position. Managers of highly complex services, such as contract administration, generally need at least a bachelor's degree in business, human resources, or finance. Regardless of major, the curriculum should include courses in office technology, accounting, business mathematics, computer applications, human resources, and business law.

Whatever the manager's educational background, it must be accompanied by related work experience reflecting demonstrated ability. For this reason, many managers have advanced through the ranks of their organization, acquiring work experience in various administrative positions before assuming first-line supervisory duties.

Persons interested in becoming general managers should have good communication skills and be able to establish effective working relationships with many different people, ranging from managers, supervisors, and professionals, to clerks and blue-collar workers. They should be analytical, detail-oriented, flexible, and decisive. They must also be able to coordinate several activities at once, quickly analyze and resolve specific problems, and cope with deadlines.

Most managers in small organizations advance by moving to other management positions or to a larger organization. Advancement is easier in large firms that employ several levels of managers. A master's degree in business administration or related field enhances a first-level manager's opportunities to advance to a mid-level management position, and eventually to a top-level management position, such as executive vice president. Those with enough money and experience can establish their own management consulting firm.

Job Outlook

Employment of general managers is projected to grow about as fast as the average for all occupations through 2012. Applicants face keen competition because there are more competent, experienced workers seeking jobs than there are positions available. At the same time, continuing corporate restructuring and increasing utilization of office technology should result in a flatter organizational structure with fewer levels of management, reducing the need for some middle management positions.

Earnings

Earnings of general managers vary greatly depending on the employer, the specialty, and the geographic area. In general, however, median annual earnings of general managers in 2002 were \$52,500. The middle 50 percent earned between \$36,190 and \$74,590. The lowest 10 percent earned less than \$26,120, and the highest 10 percent earned more than \$99,870. Median annual earnings in the industries employing the largest numbers of these managers in 2002 are shown below:

Management of companies and enterprises	\$66,700
Elementary and secondary schools	59,220
Colleges, universities, and professional schools	56,960
State government	55,710
Local government	51,570

Sources of Additional Information

For information about the Certified Manager designations, contact the Institute of Certified Professional Managers, James Madison University, College of Business, Harrisonburg, VA 22807. Internet: <http://cob.jmu.edu/icpm>

Managers (Advertising, Marketing, PR)

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Significant Points

- Keen competition for jobs is expected.
- College graduates with related experience, a high level of creativity, and strong communication skills should have the best job opportunities.
- High earnings, substantial travel, and long hours, including evenings and weekends, are common.

Nature of the Work

The objective of any firm is to market and sell its products or services profitably. In small firms, the owner or chief executive officer might assume all advertising, promotions, marketing, sales, and public relations responsibilities. In large firms, which may offer numerous products and services nationally or even worldwide, an

executive vice president directs overall advertising, promotions, marketing, sales, and public relations policies. Advertising, marketing, promotions, public relations, and sales managers coordinate the market research, marketing strategy, sales, advertising, promotion, pricing, product development, and public relations activities.

Managers oversee advertising and promotion staffs, which usually are small, except in the largest firms. In a small firm, managers may serve as a liaison between the firm and the advertising or promotion agency to which many advertising or promotional functions are contracted out. In larger firms, advertising managers oversee in-house account, creative, and media services departments. The account executive manages the account services department, assesses the need for advertising, and, in advertising agencies, maintains the accounts of clients. The creative services department develops the subject matter and presentation of advertising. The creative director oversees the copy chief, art director, and associated staff. The media director oversees planning groups that select the communication media—for example, radio, television, newspapers, magazines, Internet, or outdoor signs—to disseminate the advertising.

Promotions managers supervise staffs of promotion specialists. They direct promotion programs that combine advertising with purchase incentives to increase sales. In an effort to establish closer contact with purchasers—dealers, distributors, or consumers—promotion programs may involve direct mail, telemarketing, television or radio advertising, catalogs, exhibits, inserts in newspapers, Internet advertisements or Web sites, in store displays or product endorsements, and special events. Purchase incentives may include discounts, samples, gifts, rebates, coupons, sweepstakes, and contests.

Marketing managers develop the firm's detailed marketing strategy. With the help of subordinates, including product development managers and market research managers, they determine the demand for products and services offered by the firm and its competitors. In addition, they identify potential markets—for example, business firms, wholesalers, retailers, government, or the general public. Marketing managers develop pricing strategy with an eye towards maximizing the firm's share of the market and its profits while ensuring that the firm's customers are satisfied. In collaboration with sales, product development, and other managers, they monitor trends that indicate the need for new products and services and oversee product development. Marketing managers work with advertising and promotion managers to promote the firm's products and services and to attract potential users.

Public relations managers supervise public relations specialists. These managers direct publicity programs to a targeted public. They often specialize in a specific area, such as crisis management—or in a specific industry, such as healthcare. They use every available communication medium in their effort to maintain the support of the specific group upon whom their organization's success depends, such as consumers, stockholders, or the general public. For example, public relations managers may clarify or justify the firm's point of view on health or environmental issues to community or special interest groups.

Public relations managers also evaluate advertising and promotion programs for compatibility with public relations efforts and serve as the eyes and ears of top management. They observe social, economic, and political trends that might

ultimately affect the firm and make recommendations to enhance the firm's image based on those trends.

Public relations managers may confer with labor relations managers to produce internal company communications—such as newsletters about employee-management relations—and with financial managers to produce company reports. They assist company executives in drafting speeches, arranging interviews, and maintaining other forms of public contact; oversee company archives; and respond to information requests. In addition, some handle special events such as sponsorship of races, parties introducing new products, or other activities the firm supports in order to gain public attention through the press without advertising directly.

Sales managers direct the firm's sales program. They assign sales territories, set goals, and establish training programs for the sales representatives. Managers advise the sales representatives on ways to improve their sales performance. In large, multi-product firms, they oversee regional and local sales managers and their staffs. Sales managers maintain contact with dealers and distributors. They analyze sales statistics gathered by their staffs to determine sales potential and inventory requirements and monitor the preferences of customers. Such information is vital to develop products and maximize profits.

Working Conditions

Advertising, marketing, promotions, public relations, and sales managers work in offices close to those of top managers. Long hours, including evenings and weekends are common. About 44 percent of advertising, marketing, and public relations managers worked more than 40 hours a week in 2002. Working under pressure is unavoidable when schedules change and problems arise, but deadlines and goals must still be met.

Substantial travel may be involved. For example, attendance at meetings sponsored by associations or industries often is mandatory. Sales managers travel to national, regional, and local offices and to various dealers and distributors. Advertising and promotions managers may travel to meet with clients or representatives of communications media. At times, public relations managers travel to meet with special interest groups or government officials. Job transfers between headquarters and regional offices are common, particularly among sales managers.

Employment

Advertising, marketing, promotions, public relations, and sales managers held about 700,000 jobs in 2002. The following tabulation shows the distribution of jobs by occupational specialty.

Sales managers	343,000
Marketing managers	203,000
Advertising and promotions managers	85,000
Public relations managers	69,000

These managers were found in virtually every industry. Sales managers held almost half of the jobs; most were employed in manufacturing, wholesale and retail trade, and finance and insurance industries. Marketing managers held more one-fourth of the jobs; manufacturing, and professional, scientific, and technical services industries employed more than one-third of marketing managers. More than one-third of advertising and promotions managers worked in professional, scientific, and technical services, and information industries, including advertising and related services, and publishing industries. Most public relations managers were employed in services industries, such as other services (except government), professional, scientific, and technical services, finance and insurance, health care and social assistance services, and educational services.

Training, Other Qualifications, and Advancement

A wide range of educational backgrounds is suitable for entry into advertising, marketing, promotions, public relations, and sales managerial jobs, but many employers prefer those with experience in related occupations plus a broad liberal arts background. A bachelor's degree in sociology, psychology, literature, journalism, or philosophy, among other subjects, is acceptable. However, requirements vary, depending upon the particular job.

For marketing, sales, and promotions management positions, some employers prefer a bachelor's or master's degree in business administration with an emphasis on marketing. Courses in business law, economics, accounting, finance, mathematics, and statistics are advantageous. In highly technical industries, such as computer and electronics manufacturing, a bachelor's degree in engineering or science, combined with a master's degree in business administration, is preferred.

For advertising management positions, some employers prefer a bachelor's degree in advertising or journalism. A course of study should include marketing, consumer behavior, market research, sales, communication methods and technology, and visual arts—for example, art history and photography.

For public relations management positions, some employers prefer a bachelor's or master's degree in public relations or journalism. The applicant's curriculum should include courses in advertising, business administration, public affairs, public speaking, political science, and creative and technical writing.

For all these specialties, courses in management and completion of an internship while in school are highly recommended. Familiarity with word processing and database applications also is important for many positions. Computer skills are vital because marketing, product promotion, and advertising on the Internet are increasingly common. The ability to communicate in a foreign language may open up employment opportunities in many rapidly growing areas around the country, especially in cities with large Spanish-speaking populations.

Most advertising, marketing, promotions, public relations, and sales management positions are filled by promoting experienced staff or related professional personnel. For example, many managers are former sales representatives, purchasing agents, buyers, or product, advertising, promotions, or public relations specialists. In small firms, where the number of positions is limited, advancement to a management position usually comes slowly. In large firms, promotion may occur more quickly.

Although experience, ability, and leadership are emphasized for promotion, advancement can be accelerated by participation in management training programs conducted by many large firms. Many firms also provide their employees with continuing education opportunities, either in-house or at local colleges and universities, and encourage employee participation in seminars and conferences, often provided by professional societies. In collaboration with colleges and universities, numerous marketing and related associations sponsor national or local management training programs. Course subjects include brand and product management, international marketing, sales management evaluation, telemarketing and direct sales, interactive marketing, promotion, marketing communication, market research, organizational communication, and data processing systems procedures and management. Many firms pay all or part of the cost for those who successfully complete courses.

Some associations offer certification programs for these managers. Certification—a sign of competence and achievement in this field—is particularly important in a competitive job market. While relatively few advertising, marketing, promotions, public relations, and sales managers currently are certified, the number of managers who seek certification is expected to grow. For example, Sales and Marketing Executives International offers a management certification program based on education and job performance. The Public Relations Society of America offers a certification program for public relations practitioners based on years of experience and performance on an examination.

Persons interested in becoming advertising, marketing, promotions, public relations, and sales managers should be mature, creative, highly motivated, resistant to stress, flexible, and decisive. The ability to communicate persuasively, both orally and in writing, with other managers, staff, and the public is vital. These managers also need tact, good judgment, and exceptional ability to establish and maintain effective personal relationships with supervisory and professional staff members and client firms.

Because of the importance and high visibility of their jobs, advertising, marketing, promotions, public relations, and sales managers often are prime candidates for advancement to the highest ranks. Well-trained, experienced, successful managers may be promoted to higher positions in their own, or other, firms. Some become top executives. Managers with extensive experience and sufficient capital may open their own businesses.

Job Outlook

Advertising, marketing, promotions, public relations, and sales manager jobs are highly coveted and will be sought by other managers or highly experienced professionals, resulting in keen competition. College graduates with related experience, a high level of creativity, and strong communication skills should have the best job opportunities. Employers will particularly seek those who have the computer skills to conduct advertising, marketing, promotions, public relations, and sales activities on the Internet.

Employment of advertising, marketing, promotions, public relations, and sales managers is expected to grow faster than the average for all occupations through 2012, spurred by intense domestic and global competition in products and services

offered to consumers. However, projected employment growth varies by industry. For example, employment is projected to grow much faster than average in scientific, professional, and related services such as computer systems design and related services and advertising and related services, as businesses increasingly hire contractors for these services instead of additional full-time staff. On the other hand, little or no change in employment is expected in many manufacturing industries.

Earnings

Median annual earnings in 2002 were \$57,130 for advertising and promotions managers, \$78,250 for marketing managers, \$75,040 for sales managers, and \$60,640 for public relations managers. Earnings ranged from less than \$30,310 for the lowest 10 percent of advertising and promotions managers, to more than \$145,600 for the highest 10 percent of marketing and sales managers.

Median annual earnings advertising and promotions managers in 2002 in the advertising and related services industry were \$72,630.

Median annual earnings in the industries employing the largest numbers of marketing managers in 2002 were as follows:

Computer systems design and related services	\$96,440
Management of companies and enterprises	90,750
Depository credit intermediation	65,960

Median annual earnings in the industries employing the largest numbers of sales managers in 2002 were as follows:

Computer systems design and related services
Automobile dealers
Management of companies and enterprises
Insurance carriers
Traveler accommodation

Median annual earnings of public relations managers in 2002 in colleges, universities, and professional schools were \$55,510.

According to a National Association of Colleges and Employers survey, starting salaries for marketing majors graduating in 2003 averaged \$34,038; starting salaries for advertising majors averaged \$29,495.

Salary levels vary substantially, depending upon the level of managerial responsibility, length of service, education, firm size, location, and industry. For example, manufacturing firms usually pay these managers higher salaries than do nonmanufacturing firms. For sales managers, the size of their sales territory is another important determinant of salary. Many managers earn bonuses equal to 10 percent or more of their salaries.

Sources of Additional Information

- American Association of Advertising Agencies, 405 Lexington Ave., New York, NY 10174-1801. Internet: <http://www.aaaa.org>
- Public Relations Society of America, 33 Irving Place, New York, NY 10003-2376. Internet: <http://www.prsa.org>

Engineers

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Significant Points

- Overall, job opportunities in engineering are expected to be good, but will vary by specialty.
- A bachelor's degree is required for most entry-level jobs.
- Starting salaries are significantly higher than those of college graduates in other fields.
- Continuing education is critical to keep abreast of the latest technology.

Nature of the Work

Engineers apply the theories and principles of science and mathematics to research and develop economical solutions to technical problems. Their work is the link between perceived social needs and commercial applications. Engineers design products, machinery to build those products, plants in which those products are made, and the systems that ensure the quality of the products and the efficiency of the workforce and manufacturing process. Engineers design, plan, and supervise the construction of buildings, highways, and transit systems. They develop and implement improved ways to extract, process, and use raw materials, such as petroleum and natural gas. They develop new materials that both improve the performance of products and take advantage of advances in technology. They harness the power of the sun, the Earth, atoms, and electricity for use in supplying the Nation's power needs, and create millions of products using power. They analyze the impact of the products they develop or the systems they design on the environment and on people using them. Engineering knowledge is applied to improving many things, including the quality of healthcare, the safety of food products, and the operation of financial systems.

Engineers consider many factors when developing a new product. For example, in developing an industrial robot, engineers determine precisely what function the robot needs to perform; design and test the robot's components; fit the components together in an integrated plan; and evaluate the design's overall effectiveness, cost, reliability, and safety. This process applies to many different products, such as chemicals, computers, gas turbines, helicopters, and toys.

In addition to design and development, many engineers work in testing, production, or maintenance. These engineers supervise production in factories, determine the causes of breakdowns, and test manufactured products to maintain quality. They also estimate the time and cost to complete projects. Some move into engineering

management or into sales. In sales, an engineering background enables them to discuss technical aspects and assist in product planning, installation, and use.

Most engineers specialize. More than 25 major specialties are recognized by professional societies, and the major branches have numerous subdivisions. Some examples include structural and transportation engineering, which are subdivisions of civil engineering; and ceramic, metallurgical, and polymer engineering, which are subdivisions of materials engineering. Engineers also may specialize in one industry, such as motor vehicles, or in one field of technology, such as turbines or semiconductor materials.

This statement, which contains an overall discussion of engineering, is followed by separate statements on 14 branches of engineering: Aerospace; agricultural; biomedical; chemical; civil; computer hardware; electrical and electronics, except computer; environmental; industrial, including health and safety; materials; mechanical; mining and geological, including mining safety; nuclear; and petroleum engineering. Some branches of engineering not covered in detail in the *Handbook*, but for which there are established college programs, include architectural engineering—the design of a building’s internal support structure; and marine engineering—the design and installation of ship machinery and propulsion systems.

Engineers in each branch have a base of knowledge and training that can be applied in many fields. Electronics engineers, for example, work in the medical, computer, communications, and missile guidance fields. Because there are many separate problems to solve in a large engineering project, engineers in one field often work closely with specialists in other scientific, engineering, and business occupations.

Engineers use computers to produce and analyze designs; to simulate and test how a machine, structure, or system operates; and to generate specifications for parts. Using the Internet or related communications systems, engineers can collaborate on designs with other engineers around the country or even abroad. Many engineers also use computers to monitor product quality and control process efficiency. They spend a great deal of time writing reports and consulting with other engineers, as complex projects often require an interdisciplinary team of engineers. Supervisory engineers are responsible for major components or entire projects.

Working Conditions

Most engineers work in office buildings, laboratories, or industrial plants. Others may spend time outdoors at construction sites and oil and gas exploration and production sites, where they monitor or direct operations or solve onsite problems. Some engineers travel extensively to plants or worksites.

Many engineers work a standard 40-hour week. At times, deadlines or design standards may bring extra pressure to a job, sometimes requiring engineers to work longer hours.

Employment

In 2002 engineers held 1.5 million jobs. The following tabulation shows the distribution of employment by engineering specialty.

Total, all engineers	1,478,000	100
Electrical and electronics	292,000	19.8
Civil	228,000	15.4
Mechanical	215,000	14.5
Industrial, including health and safety	194,000	13.1
Aerospace	78,000	5.3
Computer hardware	74,000	5.0
Environmental	47,000	3.2
Chemical	33,000	2.2
Materials	24,000	1.6
Nuclear	16,000	1.1
Petroleum	14,000	0.9
Biomedical	7,600	0.5
Mining and geological, including mining safety	5,200	0.4
Marine engineers and naval architects	4,900	0.3
Agricultural	2,900	0.2
All other engineers	243,000	16.4

Almost 4 in 10 of all engineering jobs were found in manufacturing industries, such as transportation and equipment manufacturing and computer and electronic product manufacturing. About 354,000 wage and salary jobs were in the professional, scientific, and technical service industry, primarily in architectural, engineering, and related services and in scientific research and development services, where firms designed construction projects or did other engineering work on a contractual basis. Engineers also worked in the construction and transportation, telecommunications, and utilities industries.

Federal, State, and local governments employed about 192,000 engineers in 2002. About 88,000 of these were in the Federal Government, mainly in the U.S. Departments of Defense, Transportation, Agriculture, Interior, and Energy, and in the National Aeronautics and Space Administration. Most engineers in State and local government agencies worked in highway and public works departments. In 2002, about 55,000 engineers were self-employed, many as consultants.

Engineers are employed in every State, in small and large cities, and in rural areas. Some branches of engineering are concentrated in particular industries and geographic areas, as discussed later in this chapter.

Training, Other Qualifications, and Advancement

A bachelor's degree in engineering is required for almost all entry-level engineering jobs. College graduates with a degree in a physical science or mathematics occasionally may qualify for some engineering jobs, especially in specialties in high demand. Most engineering degrees are granted in electrical, electronics, mechanical, or civil engineering. However, engineers trained in one branch may work in related

branches. For example, many aerospace engineers have training in mechanical engineering. This flexibility allows employers to meet staffing needs in new technologies and specialties in which engineers may be in short supply. It also allows engineers to shift to fields with better employment prospects or to those that more closely match their interests.

Most engineering programs involve a concentration of study in an engineering specialty, along with courses in both mathematics and science. Most programs include a design course, sometimes accompanied by a computer or laboratory class or both.

In addition to the standard engineering degree, many colleges offer 2- or 4-year degree programs in engineering technology. These programs, which usually include various hands-on laboratory classes that focus on current issues, prepare students for practical design and production work, rather than for jobs that require more theoretical and scientific knowledge. Graduates of 4-year technology programs may get jobs similar to those obtained by graduates with a bachelor's degree in engineering. Engineering technology graduates, however, are not qualified to register as professional engineers under the same terms as graduates with degrees in engineering. Some employers regard technology program graduates as having skills between those of a technician and an engineer.

Graduate training is essential for engineering faculty positions and many research and development programs, but is not required for the majority of entry-level engineering jobs. Many engineers obtain graduate degrees in engineering or business administration to learn new technology and broaden their education. Many high-level executives in government and industry began their careers as engineers.

About 340 colleges and universities offer bachelor's degree programs in engineering that are accredited by the Accreditation Board for Engineering and Technology (ABET), and about 240 colleges offer accredited bachelor's degree programs in engineering technology. ABET accreditation is based on an examination of an engineering program's student achievement, program improvement, faculty, curricular content, facilities, and institutional commitment. Although most institutions offer programs in the major branches of engineering, only a few offer programs in the smaller specialties. Also, programs of the same title may vary in content. For example, some programs emphasize industrial practices, preparing students for a job in industry, whereas others are more theoretical and are designed to prepare students for graduate work. Therefore, students should investigate curricula and check accreditations carefully before selecting a college.

Admissions requirements for undergraduate engineering schools include a solid background in mathematics (algebra, geometry, trigonometry, and calculus) and science (biology, chemistry, and physics), and courses in English, social studies, humanities, and computer and information technology. Bachelor's degree programs in engineering typically are designed to last 4 years, but many students find that it takes between 4 and 5 years to complete their studies. In a typical 4-year college curriculum, the first 2 years are spent studying mathematics, basic sciences, introductory engineering, humanities, and social sciences. In the last 2 years, most courses are in engineering, usually with a concentration in one branch. For example, the last 2 years of an aerospace program might include courses in fluid mechanics, heat transfer, applied aerodynamics, analytical mechanics, flight vehicle design,

trajectory dynamics, and aerospace propulsion systems. Some programs offer a general engineering curriculum; students then specialize in graduate school or on the job.

Some engineering schools and 2-year colleges have agreements whereby the 2-year college provides the initial engineering education, and the engineering school automatically admits students for their last 2 years. In addition, a few engineering schools have arrangements whereby a student spends 3 years in a liberal arts college studying pre-engineering subjects and 2 years in an engineering school studying core subjects, and then receives a bachelor's degree from each school. Some colleges and universities offer 5-year master's degree programs. Some 5-year or even 6-year cooperative plans combine classroom study and practical work, permitting students to gain valuable experience and to finance part of their education.

All 50 States and the District of Columbia require licensure for engineers who offer their services directly to the public. Engineers who are licensed are called Professional Engineers (PE). This licensure generally requires a degree from an ABET-accredited engineering program, 4 years of relevant work experience, and successful completion of a State examination. Recent graduates can start the licensing process by taking the examination in two stages. The initial Fundamentals of Engineering (FE) examination can be taken upon graduation. Engineers who pass this examination commonly are called Engineers in Training (EIT) or Engineer Interns (EI). After acquiring suitable work experience, EITs can take the second examination, the Principles and Practice of Engineering exam. Several States have imposed mandatory continuing education requirements for relicensure. Most States recognize licensure from other States provided that the manner in which the initial license was obtained meets or exceeds their licensure requirements. Many civil, electrical, mechanical, and chemical engineers are licensed PEs.

Engineers should be creative, inquisitive, analytical, and detail-oriented. They should be able to work as part of a team and to communicate well, both orally and in writing. Communication abilities are important because engineers often interact with specialists in a wide range of fields outside engineering.

Beginning engineering graduates usually work under the supervision of experienced engineers and, in large companies may receive formal classroom or seminar-type training. As new engineers gain knowledge and experience, they are assigned more difficult projects with greater independence to develop designs, solve problems, and make decisions. Engineers may advance to become technical specialists or to supervise a staff or team of engineers and technicians. Some may eventually become engineering managers or enter other managerial or sales jobs.

Job Outlook

Overall engineering employment is expected to grow more slowly than the average for all occupations over the 2002-12 period. Engineers tend to be concentrated in slow-growing manufacturing industries, a factor which tends to hold down their employment growth. Also, many employers are increasing their use of engineering services performed in other countries. Despite this, overall job opportunities in engineering are expected to be good because the number of engineering graduates should be in rough balance with the number of job openings over this period.

Expected changes in employment and, thus, job opportunities vary by specialty. Projections range from a decline in employment of mining and geological engineers, petroleum engineers, and nuclear engineers to much faster than average growth among environmental engineers.

Competitive pressures and advancing technology will force companies to improve and update product designs and to optimize their manufacturing processes. Employers will rely on engineers to further increase productivity, as investment in plant and equipment increases to expand output of goods and services. New computer and communications systems have improved the design process, enabling engineers to produce and analyze various product designs much more rapidly than in the past and to collaborate on designs with other engineers throughout the world. Despite these widespread applications, computer technology is not expected to limit employment opportunities. Finally, additional engineers will be needed to improve or build new roads, bridges, water and pollution control systems, and other public facilities.

There is a large number of well-trained, often English-speaking engineers available in many countries who are willing to work at much lower salaries than U.S. engineers. The rise of the Internet and other electronic communications systems has made it relatively easy for much of the engineering work previously done by engineers in this country to be done by engineers in other countries, a factor that will tend to hold down employment growth.

Compared with most other workers, a smaller proportion of engineers leave their jobs each year. Nevertheless, many job openings will arise from replacement needs, reflecting the large size of this profession. Numerous job openings will be created by engineers who transfer to management, sales, or other professional occupations; additional openings will arise as engineers retire or leave the labor force for other reasons.

Many engineers work on long-term research and development projects or in other activities that continue even during economic slowdowns. In industries such as electronics and aerospace, however, large cutbacks in defense expenditures and government research and development funds in the past, as well as the trend toward contracting out engineering work to engineering services firms, both domestic and foreign, have resulted in significant layoffs of engineers.

It is important for engineers, like those working in other technical occupations, to continue their education throughout their careers because much of their value to their employer depends on their knowledge of the latest technology. Although the pace of technological change varies by engineering specialty and industry, advances in technology have significantly affected every engineering discipline. Engineers in high-technology areas, such as advanced electronics or information technology, may find that technical knowledge can become outdated rapidly. Even those who continue their education are vulnerable to layoffs if the particular technology or product in which they have specialized becomes obsolete. By keeping current in their field, engineers are able to deliver the best solutions and greatest value to their employers. Engineers who have not kept current in their field may find themselves passed over for promotions or vulnerable to layoffs, should they occur. On the other hand, it often is these high-technology areas that offer the greatest challenges, the most interesting work, and the highest salaries. Therefore, the choice of engineering

specialty and employer involves an assessment not only of the potential rewards but also of the risk of technological obsolescence.

Earnings

Aerospace Engineers: Median annual earnings of aerospace engineers were \$72,750 in 2002. The middle 50 percent earned between \$59,520 and \$88,310. The lowest 10 percent earned less than \$49,640, and the highest 10 percent earned more than \$105,060. According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in aerospace engineering received starting salary offers averaging \$48,028 a year, master's degree candidates were offered \$61,162, and Ph.D. candidates were offered \$68,406.

Chemical Engineers: Median annual earnings of chemical engineers were \$72,490 in 2002. The middle 50 percent earned between \$58,320 and \$88,830. The lowest 10 percent earned less than \$48,450, and the highest 10 percent earned more than \$107,520. According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in chemical engineering received starting offers averaging \$52,384 a year, master's degree candidates averaged \$57,857, and Ph.D. candidates averaged \$70,729.

Civil Engineers: Median annual earnings of civil engineers were \$60,070 in 2002. The middle 50 percent earned between \$48,360 and \$74,700. The lowest 10 percent earned less than \$39,960, and the highest 10 percent earned more than \$91,010. According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in civil engineering received starting offers averaging \$41,669 a year; master's degree candidates received an average offer of \$47,245, and Ph.D. candidates were offered \$69,079, on average, as an initial salary.

Computer Engineers: Median annual earnings of computer hardware engineers were \$72,150 in 2002. The middle 50 percent earned between \$56,490 and \$91,730. The lowest 10 percent earned less than \$46,190, and the highest 10 percent earned more than \$114,880. According to the National Association of Colleges and Employers, starting salary offers in 2003 for bachelor's degree candidates in computer engineering averaged \$51,343 a year; master's degree candidates averaged \$64,200.

Electrical Engineers: Median annual earnings of electrical engineers were \$68,180 in 2002. The middle 50 percent earned between \$54,550 and \$84,670. The lowest 10 percent earned less than \$44,780, and the highest 10 percent earned more than \$100,980. Median annual earnings of electronics engineers, except computer, were \$69,930 in 2002. The middle 50 percent earned between \$55,930 and \$85,980. The lowest 10 percent earned less than \$46,310, and the highest 10 percent earned more than \$103,860.

Mechanical Engineers: Median annual earnings of mechanical engineers were \$62,880 in 2002. The middle 50 percent earned between \$50,800 and \$78,040. The lowest 10 percent earned less than \$41,490, and the highest 10 percent earned more than \$93,430. According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in mechanical engineering

received starting offers averaging \$48,585 a year, master's degree candidates had offers averaging \$54,565, and Ph.D. candidates were initially offered \$69,904.

Nuclear Engineers: Median annual earnings of nuclear engineers were \$81,350 in 2002. The middle 50 percent earned between \$67,970 and \$92,930. The lowest 10 percent earned less than \$58,350, and the highest 10 percent earned more than \$111,260. In the Federal Government, nuclear engineers in supervisory, nonsupervisory, and management positions earned an average of \$73,769 a year in 2003. According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in nuclear engineering received starting offers averaging \$50,104 a year.

Petroleum Engineers: Median annual earnings of petroleum engineers were \$83,370 in 2002. The middle 50 percent earned between \$63,390 and \$105,920. The lowest 10 percent earned less than \$49,010, and the highest 10 percent earned more than \$127,950. According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in petroleum engineering received starting offers averaging \$55,987 year.

Sources of Additional Information

High school students interested in obtaining information about careers in engineering should contact: JETS-Guidance, 1420 King St., Suite 405, Alexandria, VA 22314-2794. Internet: <http://www.jets.org>

Information on ABET-accredited engineering programs is available from The Accreditation Board for Engineering and Technology, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012. Internet: <http://www.abet.org>

Those interested in information on the Professional Engineer licensure should contact:

- The National Society of Professional Engineers, 1420 King St., Alexandria, VA 22314-2794. Internet: <http://www.nspe.org>
- National Council of Examiners for Engineers and Surveying, P.O. Box 1686, Clemson, SC 29633-1686. Internet: <http://www.ncees.org>

Information on general engineering education and career resources is available from American Society for Engineering Education, 1818 N St. NW., Suite 600, Washington, DC 20036-2479. Internet: <http://www.asee.org>

Information on obtaining an engineering position with the Federal Government is available from the Office of Personnel Management (OPM) at <http://www.usajobs.opm.gov>

Non-high school students wanting more detailed information on an engineering specialty should contact societies representing the individual branches of engineering. Each can provide information about careers in the particular branch.

Significant Points

- A strong background in mathematics is essential.
- About 6 out of 10 actuaries are employed in the insurance industry.
- Employment opportunities will be good despite the limited number of openings in this small occupation, as stringent qualifying requirements limit the number of new entrants.

Nature of the Work

One of the main functions of actuaries is to help businesses assess the risk of certain events occurring and formulate policies that minimize the cost of that risk. For this reason, actuaries are essential to the insurance industry. Actuaries assemble and analyze data to estimate the probability and likely cost of the occurrence of an event such as death, sickness, injury, disability, or loss of property. Actuaries also address financial questions, including those involving the level of pension contributions required to produce a certain retirement income level and the way in which a company should invest resources to maximize return on investments in light of potential risk. Using their broad knowledge of statistics, finance, and business, actuaries help design insurance policies, pension plans, and other financial strategies in a manner that will help ensure that the plans are maintained on a sound financial basis.

Most actuaries are employed in the insurance industry, specializing in life and health insurance or property and casualty insurance. They produce probability tables that determine the likelihood that a potential future event will generate a claim. From these tables, they estimate the amount a company can expect to pay in claims. For example, property and casualty actuaries calculate the expected amount of claims resulting from automobile accidents, which varies depending on the insured person's age, sex, driving history, type of car, and other factors. Actuaries ensure that the price, or premium, charged for such insurance will enable the company to cover claims and other expenses. This premium must be profitable, yet competitive with other insurance companies. Within the life and health insurance fields, actuaries are helping to develop long-term-care insurance and annuity policies, the latter a growing investment tool for many individuals.

Actuaries in other financial services industries manage credit and help price corporate security offerings. They also devise new investment tools to help their firms compete with other financial services companies. Pension actuaries working under the provisions of the Employee Retirement Income Security Act (ERISA) of 1974 evaluate pension plans covered by that Act and report on the plans' financial soundness to participants, sponsors, and Federal regulators. Actuaries working in government help manage social programs such as Social Security and Medicare.

Actuaries may help determine company policy and may need to explain complex technical matters to company executives, government officials, shareholders, policyholders, or the public in general. They may testify before public agencies on proposed legislation affecting their businesses or explain changes in contract provisions to customers. They also may help companies develop plans to enter new

lines of business or new geographic markets with existing lines of business by forecasting demand in competitive settings.

Both staff actuaries employed by businesses and consulting actuaries provide advice to clients on a contract basis. The duties of most consulting actuaries are similar to those of other actuaries. For example, some may evaluate company pension plans by calculating the future value of employee and employer contributions and determining whether the amounts are sufficient to meet the future needs of retirees. Others help companies reduce their insurance costs by lowering the level of risk the companies take on. For instance, they may provide advice on how to lessen the risk of injury on the job, which will lower worker's compensation costs. Consulting actuaries sometimes testify in court regarding the value of the potential lifetime earnings of a person who is disabled or killed in an accident, the current value of future pension benefits (in divorce cases), or other values arrived at by complex calculations. Many consulting actuaries work in reinsurance, a field in which one insurance company arranges to share a large prospective liability policy with another insurance company in exchange for a percentage of the premium.

Working Conditions

Actuaries have desk jobs, and their offices usually are comfortable and pleasant. They often work at least 40 hours a week. Some actuaries, particularly consulting actuaries, may travel to meet with clients. Consulting actuaries also may experience more erratic employment and be expected to work more than 40 hours per week.

Employment

Actuaries held about 15,000 jobs in 2002, with more than 1 in 2 actuaries employed by insurance carriers. Others work for pension funds and insurance agents and brokers. A growing number of actuaries work for firms providing a variety of corporate services, especially management and public relations, or for firms offering consulting services. A relatively small number of actuaries are employed by security and commodity brokers or by government agencies.

Training, Other Qualifications, and Advancement

Actuaries need a strong background in mathematics and general business. Applicants for beginning actuarial jobs usually have a bachelor's degree in mathematics, actuarial science, statistics, or a business-related discipline, such as economics, finance, or accounting. About 100 colleges and universities offer an actuarial science program, and most offer a degree in mathematics, statistics, economics, or finance. Some companies hire applicants without specifying a major, provided that the applicant has a working knowledge of mathematics, including calculus, probability, and statistics, and has demonstrated this knowledge by passing one or two actuarial exams required for professional designation. Courses in economics, accounting, finance, and insurance also are useful. Companies increasingly prefer well-rounded individuals who, in addition to having acquired a strong technical background, have some training in liberal arts and business and possess strong communication skills.

In addition to knowledge of mathematics, computer skills are becoming increasingly important. Actuaries should be able to develop and use spreadsheets and databases,

as well as standard statistical analysis software. Knowledge of computer programming languages, such as Visual Basic, also is useful.

Two professional societies sponsor programs leading to full professional status in their specialty. The first, the Society of Actuaries (SOA), administers a series of actuarial examinations in the life insurance, health benefits systems, retirement systems, and finance and investment fields. The Casualty Actuarial Society (CAS), as the name indicates, gives a series of examinations in the property and casualty field, which includes fire, accident, medical malpractice, worker's compensation, and personal injury liability.

The first four exams in the SOA and CAS examination series are jointly sponsored by the two societies and cover the same material. For this reason, students do not need to commit themselves to a specialty until they have taken the initial examinations, which test an individual's competence in probability, calculus, statistics, and other branches of mathematics. The first few examinations help students evaluate their potential as actuaries. Many prospective actuaries begin taking the exams in college with the help of self-study guides and courses. Those who pass one or more examinations have better opportunities for employment at higher starting salaries than those who do not.

After graduating from college, most prospective actuaries gain on-the-job experience at an insurance company or consulting firm, while at the same time working to complete the examination process. Actuaries are encouraged to finish the entire series of examinations as soon as possible, advancing first to the Associate level (with an ASA or ACAS designation) and then to the Fellowship level (FSA or FCAS designation). Advanced topics in the casualty field include investment and assets, dynamic financial analysis, and valuation of insurance. Candidates in the SOA examination series must choose a specialty—group and health benefits, individual life and annuities, pensions, investments, or finance. Examinations are given twice a year, in the spring and the fall. Although many companies allot time to their employees for study, home study is required to pass the examinations, and many actuaries study for months to prepare for each examination. It is likewise common for employers to pay the hundreds of dollars for examination fees and study materials. Most actuaries reach the Associate level within 4 to 6 years and the Fellowship level a few years later.

Specific requirements apply to pension actuaries, who verify the financial status of defined benefit pension plans for the Federal Government. These actuaries must be enrolled by the Joint Board for the Enrollment of Actuaries. To qualify for enrollment, applicants must meet certain experience and examination requirements, as stipulated by the Board.

To perform their duties effectively, actuaries must keep up with current economic and social trends and legislation, as well as with developments in health, business, finance, and economics that could affect insurance or investment practices. Good communication and interpersonal skills also are important, particularly for prospective consulting actuaries.

Beginning actuaries often rotate among different jobs in an organization to learn various actuarial operations and phases of insurance work, such as marketing, underwriting, and product development. At first, they prepare data for actuarial

projects or perform other simple tasks. As they gain experience, actuaries may supervise clerks, prepare correspondence, draft reports, and conduct research. They may move from one company to another early in their careers as they advance to higher positions.

Advancement depends largely on job performance and the number of actuarial examinations passed. Actuaries with a broad knowledge of the insurance, pension, investment, or employee benefits fields can rise to administrative and executive positions in their companies. Actuaries with supervisory ability may advance to management positions in other areas, such as underwriting, accounting, data processing, marketing, and advertising. Some actuaries assume college and university faculty positions.

Job Outlook

Employment of actuaries is expected to grow as fast as the average for all occupations through 2012. Employment opportunities should remain good for those who qualify, because the stringent qualifying examination system restricts the number of candidates. Employment growth in the insurance industry is expected to continue at a stable pace, while more significant job growth is likely in some other industries. In addition, a small number of jobs will open up each year to replace actuaries who leave the occupation to retire or who find new jobs.

Steady demand by the insurance industry—the largest employer of actuaries—should ensure that actuary jobs in this key industry will not decrease over the projection period. Although relatively few new jobs will be created, actuaries will continue to be needed to develop, price, and evaluate a variety of insurance products and calculate the costs of new risks. Recently, employment of actuaries in life insurance had begun to decline, but the growing popularity of annuities, a financial product offered primarily by life insurance companies, has resulted in some job growth in this specialty. Also, new actuarial positions have been created in property-casualty insurance to analyze evolving risks, such as terrorism.

Some new employment opportunities for actuaries should also become available in the health-care field as health-care issues and Medicare reform continue to receive growing attention. Increased regulation of managed health-care companies and the desire to contain health-care costs will continue to provide job opportunities for actuaries, who will also be needed to evaluate the risks associated with new medical issues, such as genetic testing and the impact of new diseases. Others in this field are involved in drafting health-care legislation.

A significant proportion of new actuaries will find employment with consulting firms. Companies that may not find it cost effective to hire their own actuaries are increasingly hiring consulting actuaries to analyze various risks. Other areas with notable growth prospects are information services and accounting services. Also, because actuarial skills are increasingly seen as useful to other industries that deal with risk, such as the airline and the banking industries, additional job openings may be created in these industries.

The best job prospects for entry-level positions will be for those candidates who have passed at least one or two of the initial actuarial exams. Candidates with additional knowledge or experience, such as computer programming skills, will be particularly

attractive to employers. Most jobs in this occupation are located in urban areas, but opportunities vary by geographic location. Opportunities should be best in Illinois, New Jersey, New York, and Connecticut—the four States in which about one-third of all actuary jobs are concentrated.

Earnings

Median annual earnings of actuaries were \$69,970 in 2002. The middle 50 percent earned between \$50,510 and \$99,820. The lowest 10 percent had earnings of less than \$39,700, while the top 10 percent earned more than \$137,650.

According to the National Association of Colleges and Employers, annual starting salaries for graduates with a bachelor's degree in actuarial science averaged \$40,396 in 2003.

Insurance companies and consulting firms give merit increases to actuaries as they gain experience and pass examinations. Some companies also offer cash bonuses for each professional designation achieved. A 2003 survey by Life Office Management Association, Inc., of the largest U.S. insurance and financial services companies indicated that the average base salary for an entry-level actuary was \$46,991. Associate actuaries, who direct and provide leadership in the design, pricing, and implementation of insurance products, received an average salary of \$99,446. Actuaries at the highest technical level without managerial responsibilities reportedly were paid an average of \$104,235.

Sources of Additional Information

Career information on actuaries specializing in pensions is available from American Society of Pension Actuaries, 4245 N. Fairfax Dr., Suite 750, Arlington, VA 22203. Internet: <http://www.aspa.org>

For information about actuarial careers in life and health insurance, employee benefits and pensions, and finance and investments, contact Society of Actuaries (SOA), 475 N. Martingale Rd., Suite 800, Schaumburg, IL 60173-2226. Internet: <http://www.soa.org>

For information about actuarial careers in property and casualty insurance, contact Casualty Actuarial Society (CAS), 1100 N. Glebe Rd., Suite 600, Arlington, VA 22201. Internet: <http://www.casact.org>

The SOA and CAS jointly sponsor a Web site for those interested in pursuing an actuarial career -- <http://www.BeAnActuary.org>

For general facts about actuarial careers, contact American Academy of Actuaries, 1100 17th St. NW., 7th Floor, Washington, DC 20036. Internet: <http://www.actuary.org/index.htm>

Significant Points

- The typical physician assistant program lasts about 2 years and requires at least 2 years of college and some healthcare experience for admission.
- Most applicants to physician assistant programs hold a bachelor's or master's degree.
- Job opportunities should be good, particularly in rural and inner city clinics.
- Earnings are high.

Nature of the Work

Physician assistants (PAs) provide healthcare services under the supervision of physicians. They should not be confused with medical assistants, who perform routine clinical and clerical tasks. PAs are formally trained to provide diagnostic, therapeutic, and preventive healthcare services, as delegated by a physician. Working as members of the healthcare team, they take medical histories, examine and treat patients, order and interpret laboratory tests and x rays, make diagnoses, and prescribe medications. They also treat minor injuries, by suturing, splinting, and casting. PAs record progress notes, instruct and counsel patients, and order or carry out therapy. In 47 States and the District of Columbia, physician assistants may prescribe medications. PAs also may have managerial duties. Some order medical and laboratory supplies and equipment and may supervise technicians and assistants.

Physician assistants work under the supervision of a physician. However, PAs may be the principal care providers in rural or inner city clinics, where a physician is present for only 1 or 2 days each week. In such cases, the PA confers with the supervising physician and other medical professionals as needed or as required by law. PAs also may make house calls or go to hospitals and nursing care facilities to check on patients, after which they report back to the physician.

Many PAs work in primary care specialties, such as general internal medicine, pediatrics, and family medicine. Others specialty areas include general and thoracic surgery, emergency medicine, orthopedics, and geriatrics. PAs specializing in surgery provide preoperative and postoperative care and may work as first or second assistants during major surgery.

Working Conditions

Although PAs usually work in a comfortable, well-lighted environment, those in surgery often stand for long periods, and others do considerable walking. Schedules vary according to the practice setting, and often depend on the hours of the supervising physician. The workweek of hospital-based PAs may include weekends, nights, or early morning hospital rounds to visit patients. These workers also may be on call. PAs in clinics usually work a 40-hour week.

Employment

Physician assistants held about 63,000 jobs in 2002. The number of jobs is greater than the number of practicing PAs because some hold two or more jobs. For example, some PAs work with a supervising physician, but also work in another practice, clinic, or hospital. According to the American Academy of Physician Assistants, almost 90 percent of certified PAs were in clinical practice in 2003.

More than half of jobs for PAs were in the offices of physicians or other health practitioners. About a quarter were in hospitals. The rest were mostly in outpatient care centers, the Federal government, educational services, and employment services.

Training, Other Qualifications, and Advancement

All States require that new PAs complete an accredited, formal education program. In 2002 there were about 133 accredited or provisionally accredited education programs for physician assistants. Sixty-eight of these programs offered a master's degree, and the rest offered either a bachelor's degree or an associate degree. Most PA graduates have at least a bachelor's degree.

Admission requirements vary, but many programs require 2 years of college and some work experience in the healthcare field. Students should take courses in biology, English, chemistry, mathematics, psychology, and the social sciences. Most applicants to PA programs hold a bachelor's or master's degree. Many PAs have backgrounds as registered nurses, while others come from varied backgrounds, including military corpsman/medics and allied health occupations such as respiratory therapists, physical therapists, and emergency medical technicians and paramedics.

PA programs usually last at least 2 years and are full time. Most programs are in schools of allied health, academic health centers, medical schools, or 4-year colleges; a few are in community colleges, the military, or hospitals. Many accredited PA programs have clinical teaching affiliations with medical schools.

PA education includes classroom instruction in biochemistry, pathology, human anatomy, physiology, microbiology, clinical pharmacology, clinical medicine, geriatric and home healthcare, disease prevention, and medical ethics. Students obtain supervised clinical training in several areas, including primary care medicine, inpatient medicine, surgery, obstetrics and gynecology, geriatrics, emergency medicine, psychiatry, and pediatrics. Sometimes, PA students serve one or more of these "rotations" under the supervision of a physician who is seeking to hire a PA. The rotations often lead to permanent employment.

All States and the District of Columbia have legislation governing the qualifications or practice of physician assistants. All jurisdictions require physician assistants to pass the Physician Assistants National Certifying Examination, administered by the National Commission on Certification of Physician Assistants (NCCPA) and open to graduates of accredited PA education programs. Only those successfully completing the examination may use the credential "Physician Assistant-Certified." In order to remain certified, PAs must complete 100 hours of continuing medical education every 2 years. Every 6 years, they must pass a recertification examination or complete an alternative program combining learning experiences and a take-home examination.

Some PAs pursue additional education in a specialty such as surgery, neonatology, or emergency medicine. PA postgraduate residency training programs are available in areas such as internal medicine, rural primary care, emergency medicine, surgery, pediatrics, neonatology, and occupational medicine. Candidates must be graduates of an accredited program and be certified by the NCCPA.

Physician assistants need leadership skills, self-confidence, and emotional stability. They must be willing to continue studying throughout their career to keep up with medical advances.

As they attain greater clinical knowledge and experience, PAs can advance to added responsibilities and higher earnings. However, by the very nature of the profession, clinically practicing PAs always are supervised by physicians.

Job Outlook

Employment of PAs is expected to grow much faster than the average for all occupations through the year 2012, due to anticipated expansion of the health services industry and an emphasis on cost containment, resulting in increasing utilization of PAs by physicians and healthcare institutions.

Physicians and institutions are expected to employ more PAs to provide primary care and to assist with medical and surgical procedures because PAs are cost-effective and productive members of the healthcare team. Physician assistants can relieve physicians of routine duties and procedures. Telemedicine—using technology to facilitate interactive consultations between physicians and physician assistants—also will expand the use of physician assistants. Job opportunities for PAs should be good, particularly in rural and inner city clinics, because those settings have difficulty attracting physicians.

Besides the traditional office-based setting, PAs should find a growing number of jobs in institutional settings such as hospitals, academic medical centers, public clinics, and prisons. Additional PAs may be needed to augment medical staffing in inpatient teaching hospital settings, as the number of hours physician residents are permitted to work is reduced, encouraging hospitals to use PAs to supply some physician resident services. Opportunities will be best in States that allow PAs a wider scope of practice.

Earnings

Median annual earnings of physician assistants were \$64,670 in 2002. The middle 50 percent earned between \$49,640 and \$77,280. The lowest 10 percent earned less than \$35,410, and the highest 10 percent earned more than \$90,350. Median annual earnings of physician assistants in 2002 were \$65,910 in general medical and surgical hospitals and \$64,170 in offices of physicians.

According to the American Academy of Physician Assistants, median income for physician assistants in full-time clinical practice in 2003 was about \$72,457; median income for first-year graduates was about \$63,437. Income varies by specialty, practice setting, geographical location, and years of experience.

Sources of Additional Information

- American Academy of Physician Assistants Information Center, 950 North Washington St., Alexandria, VA 22314-1552. Internet: <http://www.aapa.org>
- Association of Physician Assistant Programs, 950 North Washington St., Alexandria, VA 22314-1552. Internet: <http://www.apap.org>
- National Commission on Certification of Physician Assistants, Inc., 6849-B Peachtree Dunwoody Rd., Atlanta, GA 30328. Internet: <http://www.nccpa.net>

Surveyors

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Significant Points

- Almost 2 out of 3 jobs were in architectural, engineering, and related services.
- Opportunities will be best for surveyors, cartographers, and photogrammetrists who have at least a bachelor's degree and strong technical skills.
- Computer skills enhance employment opportunities.

Nature of the Work

Several different types of workers are responsible for measuring and mapping the earth's surface. Traditional **land surveyors** establish official land, air space, and water boundaries. They write descriptions of land for deeds, leases, and other legal documents; define airspace for airports; and measure construction and mineral sites. Other surveyors provide data relevant to the shape, contour, location, elevation, or dimension of land or land features. **Cartographers** compile geographic, political, and cultural information and prepare maps of large areas. **Photogrammetrists** measure and analyze aerial photographs that are subsequently used to prepare detailed maps and drawings. **Surveying technicians** assist land surveyors by operating survey instruments and collecting information in the field and by performing computations and computer-aided drafting in offices. **Mapping technicians** calculate mapmaking information from field notes. They also draw topographical maps and verify their accuracy.

Land surveyors manage survey parties who measure distances, directions, and angles between points and elevations of points, lines, and contours on, above, and below the earth's surface. They plan the fieldwork, select known survey reference points, and determine the precise location of important features in the survey area. Surveyors research legal records, look for evidence of previous boundaries, and analyze the data to determine the location of boundary lines. They also record the results of surveys, verify the accuracy of data, and prepare plots, maps, and reports. Surveyors who establish boundaries must be licensed by the State in which they work. Known as professional land surveyors, they are sometimes called to provide expert testimony in court cases concerning matters pertaining to surveying.

A survey party gathers the information needed by the land surveyor. A typical survey party consists of a party chief and one or more surveying technicians and helpers. The party chief, who may be either a land surveyor or a senior surveying technician, leads day-to-day work activities. Surveying technicians assist the party chief by

adjusting and operating surveying instruments, such as the theodolite (used to measure horizontal and vertical angles) and electronic distance-measuring equipment. Surveying technicians or assistants position and hold the vertical rods, or targets, that the theodolite operator sights on to measure angles, distances, or elevations. In addition, they may hold measuring tapes, if electronic distance-measuring equipment is not used. Surveying technicians compile notes, make sketches, and enter the data obtained from surveying instruments into computers. Survey parties also may include laborers or helpers who perform less skilled duties, such as clearing brush from sight lines, driving stakes, or carrying equipment.

New technology is changing the nature of the work of surveyors and surveying technicians. On larger projects, surveyors are increasingly using the Global Positioning System (GPS), a satellite system that locates points on the earth to a high degree of precision by using radio signals transmitted via satellites. To use this system, a surveyor places a satellite signal receiver—a small instrument mounted on a tripod—on a desired point. The receiver simultaneously collects information from several satellites to establish a precise position. The receiver also can be placed in a vehicle for tracing out road systems. Because receivers now come in different sizes and shapes, and because the cost of receivers has fallen, much more surveying work can be done with GPS. Surveyors then must interpret and check the results produced by the new technology.

Cartographers measure, map, and chart the earth's surface. Their work involves everything from performing geographical research and compiling data to actually producing maps. Cartographers collect, analyze, and interpret both spatial data—such as latitude, longitude, elevation, and distance—and nonspatial data—for example, population density, land-use patterns, annual precipitation levels, and demographic characteristics. They prepare maps in either digital or graphic form, using information provided by geodetic surveys, aerial photographs, and satellite data. **Photogrammetrists** prepare detailed maps and drawings from aerial photographs, usually of areas that are inaccessible, difficult, or less cost efficient to survey by other methods. **Map editors** develop and verify the contents of maps, using aerial photographs and other reference sources. Some States require photogrammetrists to be licensed as professional land surveyors.

Some surveyors perform specialized functions closer to those of cartographers than to those of traditional surveyors. For example, **geodetic surveyors** use high-accuracy techniques, including satellite observations (remote sensing), to measure large areas of the earth's surface. **Geophysical prospecting surveyors** mark sites for subsurface exploration, usually in relation to petroleum. **Marine or hydrographic surveyors** survey harbors, rivers, and other bodies of water to determine shorelines, the topography of the bottom, water depth, and other features.

The work of surveyors and cartographers is changing because of advancements in technology, including not only the GPS, but also new earth resources data satellites, improved aerial photography, and geographic information systems (GIS)—computerized data banks of spatial data, along with the hardware, software, and staff needed to use them. These systems are capable of assembling, integrating, analyzing, and displaying data identified according to location. A GIS typically is used to handle maps which combine information that is useful for environmental studies, geology, engineering, planning, business marketing, and other disciplines. As more

of these systems are developed, a new type of mapping scientist is emerging from the older specialties of photogrammetrist and cartographer: the **geographic information specialist** combines the functions of mapping science and surveying into a broader field concerned with the collection and analysis of geographic data.

Working Conditions

Surveyors usually work an 8-hour day, 5 days a week, and may spend a lot of time outdoors. Sometimes they work longer hours during the summer, when weather and light conditions are most suitable for fieldwork. Seasonal demands for longer hours are related to demand for specific surveying services. Home purchases traditionally are related to the start and end of the school year; construction is related to the materials to be used (unlike wood framing, concrete and asphalt are restricted by outside temperatures) and aerial photography is most effective when the leaves are off the trees.

Land surveyors and technicians engage in active, sometimes strenuous, work. They often stand for long periods, walk considerable distances, and climb hills with heavy packs of instruments and other equipment. They also can be exposed to all types of weather. Traveling often is part of the job, and land surveyors and technicians may commute long distances, stay away from home overnight, or temporarily relocate near a survey site.

Although surveyors can spend considerable time indoors, planning surveys, analyzing data, and preparing reports and maps, cartographers and photogrammetrists spend virtually all of their time in offices and seldom visit the sites they are mapping.

Employment

Surveyors, cartographers, photogrammetrists, and surveying technicians held about 124,000 jobs in 2002. Architectural, engineering, and related services firms—including firms that provided surveying and mapping services to other industries on a contract basis—provided about two-thirds of jobs for these workers. Federal, State, and local governmental agencies provided almost 1 in 6 jobs. Major Federal Government employers are the U.S. Geological Survey (USGS), the Bureau of Land Management (BLM), the Army Corps of Engineers, the Forest Service (USFS), the National Oceanic and Atmospheric Administration (NOAA), the National Imagery and Mapping Agency (NIMA), and the Federal Emergency Management Agency (FEMA). Most surveyors in State and local government work for highway departments and urban planning and redevelopment agencies. Construction firms, mining and oil and gas extraction companies, and utilities also employ surveyors, cartographers, photogrammetrists, and surveying technicians. Only a small number were self-employed in 2002.

Training, Other Qualifications, and Advancement

Most people prepare for a career as a licensed surveyor by combining postsecondary school courses in surveying with extensive on-the-job training. However, as technology advances, a 4-year college degree is increasingly becoming a prerequisite. About 50 universities now offer 4-year programs leading to a B.S. degree in surveying. Junior and community colleges, technical institutes, and

vocational schools offer 1-, 2-, and 3-year programs in both surveying and surveying technology.

All 50 States and all U.S. territories (Puerto Rico, Guam, the Mariana Islands, and the Virgin Islands) license land surveyors. For licensure, most State licensing boards require that individuals pass a written examination given by the National Council of Examiners for Engineering and Surveying. Most States also require surveyors to pass a written examination prepared by the State licensing board. In addition, candidates must meet varying standards of formal education and work experience in the field.

In the past, many with little formal training in surveying started as members of survey crews and worked their way up to become licensed surveyors. However, because of advancing technology and rising licensing standards, formal education requirements are increasing. Specific requirements vary among States. Generally, the quickest route to licensure is a combination of 4 years of college, up to 4 years of experience under the supervision of an experienced surveyor (a few States do not require any such experience), and passing the licensing examinations. An increasing number of States require a bachelor's degree in surveying or in a closely related field, such as civil engineering or forestry (with courses in surveying), regardless of the number of years of experience. Many states also have a continuing education requirement.

High school students interested in surveying should take courses in algebra, geometry, trigonometry, drafting, mechanical drawing, and computer science. High school graduates with no formal training in surveying usually start as apprentices. Beginners with postsecondary school training in surveying usually can start as technicians or assistants. With on-the-job experience and formal training in surveying—either in an institutional program or from a correspondence school—workers may advance to senior survey technician, then to party chief, and, in some cases, to licensed surveyor (depending on State licensing requirements).

The National Society of Professional Surveyors, a member organization of the American Congress on Surveying and Mapping, has a voluntary certification program for surveying technicians. Technicians are certified at four levels requiring progressive amounts of experience, in addition to the passing of written examinations. Although not required for State licensure, many employers require certification for promotion to positions with greater responsibilities.

Surveyors should have the ability to visualize objects, distances, sizes, and abstract forms. They must work with precision and accuracy, because mistakes can be costly. Members of a survey party must be in good physical condition, because they work outdoors and often carry equipment over difficult terrain. They need good eyesight, coordination, and hearing to communicate verbally and manually (using hand signals). Surveying is a cooperative operation, so good interpersonal skills and the ability to work as part of a team are important. Good office skills also are essential, because surveyors must be able to research old deeds and other legal papers and prepare reports that document their work.

Cartographers and photogrammetrists usually have a bachelor's degree in a field such as engineering, forestry, geography, or a physical science. Although it is possible to enter these positions through previous experience as a photogrammetric or cartographic technician, nowadays most cartographic and photogrammetric

technicians have had some specialized postsecondary school training. With the development of GIS, cartographers and photogrammetrists need additional education and stronger technical skills—including more experience with computers—than in the past.

The American Society for Photogrammetry and Remote Sensing has a voluntary certification program for photogrammetrists. To qualify for this professional distinction, individuals must meet work experience standards and pass an oral or a written examination.

Job Outlook

Overall employment of surveyors, cartographers, photogrammetrists, and surveying technicians is expected to grow about as fast as the average for all occupations through the year 2012. The widespread availability and use of advanced technologies, such as GPS, GIS, and remote sensing, will continue to increase both the accuracy and productivity of these workers, resulting in modest overall growth in employment. However, job openings will continue to result from the need to replace workers who transfer to other occupations or who leave the labor force altogether.

As technologies become more complex, opportunities will be best for surveyors, cartographers, and photogrammetrists who have at least a bachelor's degree and strong technical skills. Increasing demand for geographic data, as opposed to traditional surveying services, will mean better opportunities for cartographers and photogrammetrists who are involved in the development and use of geographic and land information systems. New technologies, such as GPS and GIS, also may enhance employment opportunities for surveyors, as well as for those surveying technicians who have the educational background and who have acquired technical skills that enable them to work with the new systems. At the same time, upgraded licensing requirements will continue to limit opportunities for professional advancement for those without bachelor's degrees.

Opportunities for surveyors, cartographers, and photogrammetrists should remain concentrated in architectural, engineering, and related services firms. However, nontraditional areas, such as urban planning, emergency preparedness, and natural resource exploration and mapping, also should provide employment growth, particularly with regard to producing maps for the management of emergencies and updating maps with the newly available technology. Continued growth in construction through 2012 will require surveyors to lay out streets, shopping centers, housing developments, factories, office buildings, and recreation areas, while setting aside flood plains, wetlands, wildlife habitats, and environmentally sensitive areas for protection. However, employment may fluctuate from year to year along with construction activity or with mapping needs for land and resource management.

Earnings

Median annual earnings of cartographers and photogrammetrists were \$42,870 in 2002. The middle 50 percent earned between \$32,580 and \$55,610. The lowest 10 percent earned less than \$25,810 and the highest 10 percent earned more than \$69,320.

Median annual earnings of surveyors were \$39,970 in 2002. The middle 50 percent earned between \$29,320 and \$53,440. The lowest 10 percent earned less than \$22,260, and the highest 10 percent earned more than \$67,700. Median hourly earnings of surveyors employed in architectural, engineering, and related services were \$38,370 in 2002.

Median annual earnings of surveying and mapping technicians were \$29,230 in 2002. The middle 50 percent earned between \$22,640 and \$39,070 in 2002. The lowest 10 percent earned less than \$18,490, and the highest 10 percent earned more than \$48,970. Median annual earnings of surveying and mapping technicians employed in architectural, engineering, and related services were \$27,130 in 2002, while those employed by local governments had median annual earnings of \$33,680.

In 2003, land surveyors in nonsupervisory, supervisory, and managerial positions in the Federal Government earned an average salary of \$62,980; cartographers, \$67,989; geodetic technicians, \$55,374; surveying technicians, \$33,316; and cartographic technicians, \$43,517.

Sources of Additional Information

For career information on surveyors, cartographers, photogrammetrists, and surveying technicians, contact:

- The American Congress on Surveying and Mapping, Suite #403, 6 Montgomery Village Ave., Gaithersburg, MD 20879. Internet: <http://www.acsm.net>
- National Society of Professional Surveyors, Suite #403, 6 Montgomery Village Ave., Gaithersburg, MD 20879. Internet: <http://www.acsm.net/nsps>
- American Association of Geodetic Surveying (AAGS), Suite #403, 6 Montgomery Village Ave., Gaithersburg, MD 20879. Internet: <http://www.acsm.net/aags>
- ASPRS: The Imaging and Geospatial Information Society, 5410 Grosvenor Ln., Suite 210, Bethesda, MD 20814-2160. Internet: <http://www.asprs.org>

Securities and Financial Sales Agents

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Significant Points

- Employment is expected to grow as fast as the average, and competition for entry-level jobs is expected to be keen because sales agents who succeed often have high earnings.
- A college degree, sales ability, good interpersonal and communication skills, and a strong desire to succeed are important qualifications for this profession.
- Beginning securities and commodities sales agents must pass a licensing exam to sell securities and commodities.

Nature of the Work

Most investors, whether they are individuals with a few hundred dollars to invest or large institutions with millions, use **securities, commodities, and financial**

services sales agents when buying or selling stocks, bonds, shares in mutual funds, insurance annuities, or other financial products. In addition, many clients seek out these agents for advice on investments, estate planning, and other financial matters.

Securities and commodities sales agents, also called brokers, stockbrokers, registered representatives, account executives, or financial consultants, perform a variety of tasks, depending on their specific job duties. When an investor wishes to buy or sell a security, for example, sales agents may relay the order through their firm's computers to the floor of a securities exchange, such as the New York Stock Exchange. There, securities and commodities sales agents known as **floor brokers** negotiate the price with other floor brokers, make the sale, and forward the purchase price to the sales agents. If a security is not traded on an exchange, as in the case of bonds and over-the-counter stocks, the broker sends the order to the firm's trading department. Here, using their own funds or those of the firm, other securities sales agents, known as **dealers**, buy and sell securities directly from other dealers, with the intention of reselling the security to customers at a profit. After the transaction has been completed, the broker notifies the customer of the final price.

Securities and commodities sales agents also provide many related services for their customers. They may explain stock market terms and trading practices, offer financial counseling or advice on the purchase or sale of particular securities, and design an individual client's financial portfolio, which could include securities, life insurance, corporate and municipal bonds, mutual funds, certificates of deposit, annuities, and other investments.

Not all customers have the same investment goals. Some individuals prefer long-term investments, for capital growth or to provide income over a number of years; others might want to invest in speculative securities, which they hope will quickly rise in price. Based on each customer's objectives, securities and commodities sales agents furnish information about the advantages and disadvantages of an investment. They also supply the latest price quotes on any securities, as well as information on the activities and financial positions of the corporations issuing the securities.

Most securities and commodities sales agents serve individual investors; others specialize in institutional investors, such as banks and pension funds. In institutional investing, sales agents usually concentrate on a specific financial product, such as stocks, bonds, options, annuities, or commodity futures. At other times, they may also handle the sale of new issues, such as corporate securities issued to finance the expansion of a plant.

The most important part of a sales representative's job is finding clients and building a customer base. Thus, beginning securities and commodities sales agents spend much of their time searching for customers—relying heavily on telephone solicitation. They also may meet clients through business and social contacts. Many sales agents find it useful to contact potential clients by teaching adult education investment courses or by giving lectures at libraries or social clubs. Brokerage firms may give sales agents lists of people with whom the firm has done business in the past. Some agents inherit the clients of agents who have retired. After an agent is established, referrals from satisfied clients are an important source of new business.

Financial services sales agents sell a wide variety of banking and related services. They contact potential customers to explain their services and to ascertain customers' banking and other financial needs. In doing so, they discuss services such as loans, deposit accounts, lines of credit, sales or inventory financing, certificates of deposit, cash management, mutual funds, or investment services. They also may solicit businesses to participate in consumer credit card programs. Financial services sales agents who serve all the financial needs of a single affluent individual or a business often are called private bankers or relationship managers.

With deregulation of the financial services industry, the distinctions among sales agents are becoming less clear as securities firms, banks, and insurance companies venture further and further into each other's products and services. The agents' jobs also are becoming more important as competition between the firms intensifies.

Working Conditions

Most securities and commodities sales agents work in offices under fairly stressful conditions. They have access to "quote boards" or computer terminals that continually provide information on the prices of securities. When sales activity increases, due perhaps to unanticipated changes in the economy, the pace can become very hectic.

Established securities and commodities sales agents usually work a standard 40-hour week. Beginners who are seeking customers usually work longer hours. New brokers spend a great deal of time learning the firm's products and services and studying for exams in order to qualify to sell other products, such as insurance and commodities. Most securities and commodities sales agents accommodate customers by meeting with them in the evenings or on weekends.

A growing number of securities sales agents, employed mostly by discount or online brokerage firms, work in call-center environments. In these centers, hundreds of agents spend much of the day on the telephone taking orders from clients or offering advice and information on different securities. Often, such call centers operate 24 hours a day, requiring agents to work in shifts.

Financial services sales agents normally work 40 hours a week in a comfortable, less stressful office environment. They may spend considerable time outside the office, meeting with current and prospective clients, attending civic functions, and participating in trade association meetings. Some financial services sales agents work exclusively inside banks, providing service to walk-in customers.

Employment

Securities, commodities, and financial services sales agents held about 300,000 jobs in 2002. More than half of jobs were found in securities, commodity contracts, and other financial investments and related activities. One in 5 worked in depository and non-depository credit intermediation, including commercial banks, savings institutions, and credit unions. Although securities and commodities sales agents are employed by firms in all parts of the country, many work for a small number of large securities and investment banking firms headquartered in New York City. About 1 securities, commodities, and financial services sales agent in 8 was self-employed.

Training, Other Qualifications, and Advancement

Because securities and commodities sales agents must be knowledgeable about economic conditions and trends, a college education is important, especially in larger securities firms. In fact, the overwhelming majority of workers in this occupation are college graduates. Although employers seldom require specialized academic training, courses in business administration, economics, and finance are helpful.

Many employers consider personal qualities and skills more important than academic training. Employers seek applicants who have considerable sales ability, good interpersonal and communication skills, and a strong desire to succeed. Some employers also make sure that applicants have a good credit history and a clean record. Self-confidence and an ability to handle frequent rejections are important ingredients for success.

Because maturity and the ability to work independently are important, many employers prefer to hire those who have achieved success in other jobs. Some firms prefer candidates with sales experience, particularly those who have worked on commission in areas such as real estate or insurance. Therefore, most entrants to this occupation transfer from other jobs. Some begin working as securities and commodities sales agents following retirement from other fields.

Securities and commodities sales agents must meet State licensing requirements, which usually include passing an examination and, in some cases, furnishing a personal bond. In addition, sales agents must register as representatives of their firm with the National Association of Securities Dealers, Inc. (NASD). Before beginners can qualify as registered representatives, they must pass the General Securities Registered Representative Examination (Series 7 exam), administered by the NASD, and be an employee of a registered firm for at least 4 months.

Most States require a second examination: the Uniform Securities Agents State Law Examination. This test measures the prospective representative's knowledge of the securities business in general, of customer protection requirements, and of recordkeeping procedures. Many take correspondence courses in preparation for the securities examinations. Within 2 years, brokers are encouraged to take additional licensing exams in order to sell mutual funds, insurance, and commodities.

Most employers provide on-the-job training to help securities and commodities sales agents meet the registration requirements for certification. In most firms, the training period takes about 4 months.

Trainees in large firms may receive classroom instruction in securities analysis, effective speaking, and the finer points of selling, may take courses offered by business schools and associations, and may undergo a period of on-the-job training lasting up to 2 years. Many firms like to rotate their trainees among various departments, to give them a broad perspective of the securities business. In small firms, sales agents often receive training in outside institutions and on the job.

Securities and commodities sales agents must understand the basic characteristics of the wide variety of financial products offered by brokerage firms. Brokers periodically take training through their firms or outside institutions in order to keep abreast of new financial products and improve their sales techniques. Computer training also is

important, because the securities sales business is highly automated. Since 1995, it has become mandatory for all registered securities and commodities sales agents to attend periodic continuing education classes to maintain their licenses. Courses consist of computer-based training in regulatory matters and company training on new products and services.

The principal form of advancement for securities and commodities sales agents is an increase in the number and size of the accounts they handle. Although beginners usually service the accounts of individual investors, they may eventually handle very large institutional accounts, such as those of banks and pension funds. After taking a series of tests, some brokers become portfolio managers and have greater authority to make investment decisions regarding an account. Some experienced sales agents become branch office managers and supervise other sales agents while continuing to provide services for their own customers. A few agents advance to top management positions or become partners in their firms.

Banks and other credit institutions prefer to hire college graduates for financial services sales jobs. A business administration degree with a specialization in finance or a liberal arts degree that includes courses in accounting, economics, and marketing serves as excellent preparation for this job. Often, financial services sales agents learn their jobs through on-the-job training under the supervision of bank officers. However, those who wish to sell mutual funds and insurance products may need to undergo formal training and pass some of the same exams required of securities sales agents.

Job Outlook

Employment of securities, commodities, and financial services sales agents is expected to grow about as fast as the average for all occupations through 2012. As people's incomes continue to climb, they will increasingly seek the advice and services of securities, commodities, and financial services sales agents to realize their financial goals. Growth in the volume of trade in stocks over the Internet will reduce the need for brokers for many transactions. Nevertheless, the overall increase in investment is expected to spur employment growth among these workers, with a majority of transactions still requiring the advice and services of securities, commodities, and financial services sales agents.

Baby boomers in their peak savings years will fuel much of this increase in investment. Saving for retirement has been made much easier by the government, which continues to offer a number of tax-favorable pension plans, such as the 401(k) and the Roth IRA. The participation of more women in the workforce also means higher household incomes and more women qualifying for pensions. Many of these pensions are self-directed, meaning that the recipient has the responsibility for investing the money. With such large amounts of money to invest, sales agents, in their role as financial advisors, will be in great demand.

Other factors that will affect the demand for brokers are the increasing number and complexity of investment products, as well as the effects of globalization. As the public and businesses become more sophisticated about investing, they are venturing into the options and futures markets. Brokers are needed to buy or sell these products, which are not traded online. In addition, markets for investment are expanding with the increase in global trading of stocks and bonds. Furthermore, the

New York Stock Exchange has extended its trading hours to accommodate trading in foreign stocks and compete with foreign exchanges.

Employment of brokers is adversely affected by downturns in the stock market or the economy. Turnover is high for beginning brokers, who often are unable to establish a sizable clientele even in good times. Once established, securities and commodities sales agents have a very strong attachment to their occupation because of their high earnings and the considerable investment in training. Competition usually is intense, especially in larger companies with more applicants than jobs. Opportunities for beginning brokers should be better in smaller firms.

The number of financial services sales agents in banks will increase faster than average as banks expand their product offerings in order to compete directly with other investment firms.

Earnings

Median annual earnings of securities, commodities, and financial services sales agents were \$60,990 in 2002. The middle half earned between \$36,180 and \$117,050.

Median annual earnings in the industries employing the largest numbers of securities and financial services sales agents in 2002 were as follows:

Securities and commodity contracts intermediation and brokerage	\$78,140
Other financial investment activities	75,110
Management of companies and enterprises	54,730
Nondepository credit intermediation	43,220
Depository credit intermediation	39,870

Stockbrokers, who provide personalized service and more guidance with respect to a client's investments, usually are paid a commission based on the amount of stocks, bonds, mutual funds, insurance, and other products they sell. Earnings from commissions are likely to be high when there is much buying and selling, low when there is a slump in market activity. Most firms provide sales agents with a steady income by paying a "draw against commission"—a minimum salary based on commissions they can be expected to earn. Securities and commodities sales agents who can provide their clients with the most thorough financial services should enjoy the greatest income stability. Trainee brokers usually are paid a salary until they develop a client base. The salary gradually decreases in favor of commissions as the broker gains clients. A small, but increasing, number of full-service brokers are paid a percentage of the assets they oversee. This fee often covers a certain number of trades done free.

Brokers who work for discount brokerage firms that promote the use of telephone and online trading services usually are paid a salary, sometimes boosted by bonuses that reflect the profitability of the office. Financial services sales agents usually are paid a salary also; however, bonuses or commissions from sales are starting to account for a larger share of their income.

Sources of Additional Information

For general information on the securities industry, contact Securities Industry Association, 120 Broadway, New York, NY 10271.

For information about job opportunities for financial services sales agents in various States, contact State bankers' associations or write directly to a particular bank.

Computer Systems Analysts

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Significant Points

- Education requirements range from a 2-year degree to a graduate degree.
- Employment is expected to increase much faster than the average as organizations continue to adopt increasingly sophisticated technologies.
- Job prospects are favorable.

Nature of the Work

The rapid spread of computers and information technology has generated a need for highly trained workers to design and develop new hardware and software systems and to incorporate new technologies. These workers—computer systems analysts, database administrators, and computer scientists—include a wide range of computer specialists. Job tasks and occupational titles used to describe these workers evolve rapidly, reflecting new areas of specialization or changes in technology, as well as the preferences and practices of employers.

Systems analysts solve computer problems and apply computer technology to meet the individual needs of an organization. They help an organization to realize the maximum benefit from its investment in equipment, personnel, and business processes. Systems analysts may plan and develop new computer systems or devise ways to apply existing systems' resources to additional operations. They may design new systems, including both hardware and software, or add a new software application to harness more of the computer's power. Most systems analysts work with specific types of systems—for example, business, accounting, or financial systems, or scientific and engineering systems—that vary with the kind of organization. Some systems analysts also are known as **systems developers or systems architects**.

Systems analysts begin an assignment by discussing the systems problem with managers and users to determine its exact nature. Defining the goals of the system and dividing the solutions into individual steps and separate procedures, systems analysts use techniques such as structured analysis, data modeling, information engineering, mathematical model building, sampling, and cost accounting to plan the system. They specify the inputs to be accessed by the system, design the processing steps, and format the output to meet users' needs. They also may prepare cost-benefit and return-on-investment analyses to help management decide whether implementing the proposed technology will be financially feasible.

When a system is accepted, systems analysts determine what computer hardware and software will be needed to set the system up. They coordinate tests and observe the initial use of the system to ensure that it performs as planned. They prepare specifications, flow charts, and process diagrams for computer programmers to follow; then, they work with programmers to “debug,” or eliminate, errors from the system. Systems analysts who do more in-depth testing of products may be referred to as **software quality assurance analysts**. In addition to running tests, these individuals diagnose problems, recommend solutions, and determine whether program requirements have been met.

In some organizations, **programmer-analysts** design and update the software that runs a computer. Because they are responsible for both programming and systems analysis, these workers must be proficient in both areas. As this dual proficiency becomes more commonplace, these analysts increasingly work with databases, object-oriented programming languages, as well as client-server applications development and multimedia and Internet technology.

One obstacle associated with expanding computer use is the need for different computer systems to communicate with each other. Because of the importance of maintaining up-to-date information—accounting records, sales figures, or budget projections, for example—systems analysts work on making the computer systems within an organization, or among organizations, compatible so that information can be shared among them. Many systems analysts are involved with “networking,” connecting all the computers internally—in an individual office, department, or establishment—or externally, because many organizations now rely on e-mail or the Internet. A primary goal of networking is to allow users to retrieve data from a mainframe computer or a server and use it on their desktop computer. Systems analysts must design the hardware and software to allow the free exchange of data, custom applications, and the computer power to process it all. For example, analysts are called upon to ensure the compatibility of computing systems between and among businesses to facilitate electronic commerce.

Networks come in many variations, so **network systems and data communications analysts** are needed to design, test, and evaluate systems such as local area networks (LANs), wide area networks (WANs), the Internet, intranets, and other data communications systems. Systems can range from a connection between two offices in the same building to globally distributed networks, voice mail, and e-mail systems of a multinational organization. Network systems and data communications analysts perform network modeling, analysis, and planning; they also may research related products and make necessary hardware and software recommendations. **Telecommunications specialists** focus on the interaction between computer and communications equipment. These workers design voice and data communication systems, supervise the installation of those systems, and provide maintenance and other services to clients after the system is installed.

The growth of the Internet and the expansion of the World Wide Web have generated a variety of occupations related to the design, development, and maintenance of Web sites and their servers. For example, **webmasters** are responsible for all technical aspects of a Web site, including performance issues such as speed of access, and for approving the content of the site. **Internet developers or Web developers**, also called **Web designers**, are responsible for day-to-day site design and creation.

Computer scientists work as theorists, researchers, or inventors. Their jobs are distinguished by the higher level of theoretical expertise and innovation they apply to complex problems and the creation or application of new technology. Those employed by academic institutions work in areas ranging from complexity theory, to hardware, to programming-language design. Some work on multidisciplinary projects, such as developing and advancing uses of virtual reality, extending human-computer interaction, or designing robots. Their counterparts in private industry work in areas such as applying theory, developing specialized languages or information technologies, or designing programming tools, knowledge-based systems, or even computer games.

With the Internet and electronic business generating large volumes of data, there is a growing need to be able to store, manage, and extract data effectively. **Database administrators** work with database management systems software and determine ways to organize and store data. They identify user requirements, set up computer databases, and test and coordinate modifications to the systems. An organization's database administrator ensures the performance of the system, understands the platform on which the database runs, and adds new users to the system. Because they also may design and implement system security, database administrators often plan and coordinate security measures. With the volume of sensitive data generated every second growing rapidly, data integrity, backup systems, and database security have become increasingly important aspects of the job of database administrators.

Working Conditions

Computer systems analysts, database administrators, and computer scientists normally work in offices or laboratories in comfortable surroundings. They usually work about 40 hours a week—the same as many other professional or office workers do. However, evening or weekend work may be necessary to meet deadlines or solve specific problems. Given the technology available today, telecommuting is common for computer professionals. As networks expand, more work can be done from remote locations through modems, laptops, electronic mail, and the Internet.

Like other workers who spend long periods in front of a computer terminal typing on a keyboard, computer systems analysts, database administrators, and computer scientists are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome or cumulative trauma disorder.

Employment

Computer systems analysts, database administrators, and computer scientists held about 979,000 jobs in 2002; including about 89,000 who were self-employed. Employment was distributed among the following detailed occupations:

Computer systems analysts	468,000
Network systems and data communications analysts	186,000
Database administrators	110,000
Computer and information scientists, research	23,000
All other computer specialists	192,000

Although they are increasingly employed in every sector of the economy, the greatest concentration of these workers is in the computer systems design and related services industry. Firms in this industry provide services related to the commercial use of computers on a contract basis, including custom computer programming services; computer systems integration design services; computer facilities management services, including computer systems or data-processing facilities support services for clients; and other computer-related services, such as disaster recovery services and software installation. Many computer systems analysts, database administrators, and computer scientists are employed by Internet service providers, web search portals, and data-processing, hosting, and related services firms. Others work for government, manufacturers of computer and electronic products, insurance companies, financial institutions, and universities.

A growing number of computer specialists, such as systems analysts and network and data communications analysts, are employed on a temporary or contract basis; many of these individuals are self-employed, working independently as contractors or consultants. For example, a company installing a new computer system may need the services of several systems analysts just to get the system running. Because not all of the analysts would be needed once the system is functioning, the company might contract for such employees with a temporary help agency or a consulting firm or with the systems analysts themselves. Such jobs may last from several months up to 2 years or more. This growing practice enables companies to bring in people with the exact skills the firm needs to complete a particular project, rather than having to spend time or money training or retraining existing workers. Often, experienced consultants then train a company's in-house staff as a project develops.

Training, Other Qualifications, and Advancement

Rapidly changing technology requires an increasing level of skill and education on the part of employees. Companies look for professionals with an ever-broader background and range of skills, including not only technical knowledge, but also communication and other interpersonal skills. This shift from requiring workers to possess solely sound technical knowledge emphasizes workers who can handle various responsibilities. While there is no universally accepted way to prepare for a job as a systems analyst, computer scientist, or database administrator, most employers place a premium on some formal college education. A bachelor's degree is a prerequisite for many jobs; however, some jobs may require only a 2-year degree. Relevant work experience also is very important. For more technically complex jobs, persons with graduate degrees are preferred.

For systems analyst, programmer-analyst, and database administrator positions, many employers seek applicants who have a bachelor's degree in computer science, information science, or management information systems (MIS). MIS programs usually are part of the business school or college and differ considerably from computer science programs, emphasizing business and management-oriented course work and business computing courses. Employers are increasingly seeking individuals with a master's degree in business administration (MBA), with a concentration in information systems, as more firms move their business to the Internet. For some network systems and data communication analysts, such as webmasters, an associate's degree or certificate is sufficient; although more advanced positions might require a computer-related bachelor's degree. For

computer and information scientists, a doctoral degree generally is required due to the highly technical nature of their work.

Despite employers' preference for those with technical degrees, persons with degrees in a variety of majors find employment in these computer occupations. The level of education and type of training that employers require depend on their needs. One factor affecting these needs is changes in technology. Employers often scramble to find workers capable of implementing "hot" new technologies. Those workers with formal education or experience in information security, for example, are in demand because of the growing need for their skills and services. Another factor driving employers' needs is the timeframe during which a project must be completed.

Most community colleges and many independent technical institutes and proprietary schools offer an associate's degree in computer science or a related information technology field. Many of these programs may be more geared toward meeting the needs of local businesses and are more occupation specific than are 4-year degree programs. Some jobs may be better suited to the level of training that such programs offer. Employers usually look for people who have broad knowledge and experience related to computer systems and technologies, strong problem-solving and analytical skills, and good interpersonal skills. Courses in computer science or systems design offer good preparation for a job in these computer occupations. For jobs in a business environment, employers usually want systems analysts to have business management or closely related skills, while a background in the physical sciences, applied mathematics, or engineering is preferred for work in scientifically oriented organizations. Art or graphic design skills may be desirable for webmasters or Web developers.

Jobseekers can enhance their employment opportunities by participating in internship or co-op programs offered through their schools. Because many people develop advanced computer skills in a non-computer-related occupation and then transfer those skills to a computer occupation, a background in the industry in which the person's job is located, such as financial services, banking, or accounting, can be important. Others have taken computer science courses to supplement their study in fields such as accounting, inventory control, or other business areas. For example, a financial analyst who is proficient in computers might become a computer support specialist in financial systems development, while a computer programmer might move into a systems analyst job.

Computer systems analysts, database administrators, and computer scientists must be able to think logically and have good communication skills. Because they often deal with a number of tasks simultaneously, the ability to concentrate and pay close attention to detail is important. Although these computer specialists sometimes work independently, they frequently work in teams on large projects. They must be able to communicate effectively with computer personnel, such as programmers and managers, as well as with users or other staff who may have no technical computer background.

Computer scientists employed in private industry may advance into managerial or project leadership positions. Those employed in academic institutions can become heads of research departments or published authorities in their field. Systems analysts may be promoted to senior or lead systems analyst. Those who show leadership ability also can become project managers or advance into management

positions such as manager of information systems or chief information officer. Database administrators may advance into managerial positions, such as chief technology officer, based on their experience managing data and enforcing security. Computer specialists with work experience and considerable expertise in a particular subject or a certain application may find lucrative opportunities as independent consultants or may choose to start their own computer-consulting firms.

Technological advances come so rapidly in the computer field that continuous study is necessary to keep one's skills up to date. Employers, hardware and software vendors, colleges and universities, and private training institutions offer continuing education. Additional training may come from professional development seminars offered by professional computing societies.

Certification is a way to demonstrate a level of competence in a particular field. Some product vendors or software firms offer certification and require professionals who work with their products to be certified. Many employers regard these certifications as the industry standard. For example, one method of acquiring enough knowledge to get a job as a database administrator is to become certified in a specific type of database management. Voluntary certification also is available through various organizations associated with computer specialists. Professional certification may afford a jobseeker a competitive advantage.

Job Outlook

Computer systems analysts, database administrators, and computer scientists are expected to be among the fastest growing occupations through 2012. Employment of these computer specialists is expected to grow much faster than the average for all occupations as organizations continue to adopt and integrate increasingly sophisticated technologies. Job increases will be driven by very rapid growth in computer system design and related services, which is projected to be one of the fastest-growing industries in the U.S. economy. In addition, many job openings will arise annually from the need to replace workers who move into managerial positions or other occupations or who leave the labor force. Job growth will not be as rapid as during the previous decade, however, as the information technology sector begins to mature and as routine work is increasingly outsourced overseas.

Despite the recent economic downturn among information technology firms, workers in the occupation should still enjoy favorable job prospects. The demand for networking to facilitate the sharing of information, the expansion of client-server environments, and the need for computer specialists to use their knowledge and skills in a problem-solving capacity will be major factors in the rising demand for computer systems analysts, database administrators, and computer scientists. Moreover, falling prices of computer hardware and software should continue to induce more businesses to expand their computerized operations and integrate new technologies into them. In order to maintain a competitive edge and operate more efficiently, firms will keep demanding computer specialists who are knowledgeable about the latest technologies and are able to apply them to meet the needs of businesses.

Increasingly, more sophisticated and complex technology is being implemented across all organizations, which should fuel the demand for these computer occupations. There is a growing demand for system analysts to help firms maximize

their efficiency with available technology. Expansion of electronic commerce—doing business on the Internet—and the continuing need to build and maintain databases that store critical information on customers, inventory, and projects are fueling demand for database administrators familiar with the latest technology. In addition, the increasing importance being placed on “cyber security”—the protection of electronic information—will result in a need for workers skilled in information security.

The development of new technologies usually leads to demand for various kinds of workers. The expanding integration of Internet technologies into businesses, for example, has resulted in a growing need for specialists who can develop and support Internet and intranet applications. The growth of electronic commerce means that more establishments use the Internet to conduct their business online. The introduction of the wireless Internet, known as WiFi, creates new systems to be analyzed and new data to be administered. The spread of such new technologies translates into a need for information technology professionals who can help organizations use technology to communicate with employees, clients, and consumers. Explosive growth in these areas also is expected to fuel demand for specialists who are knowledgeable about network, data, and communications security.

As technology becomes more sophisticated and complex, employers demand a higher level of skill and expertise from their employees. Individuals with an advanced degree in computer science or computer engineering or with an MBA with a concentration in information systems should enjoy highly favorable employment prospects. College graduates with a bachelor’s degree in computer science, computer engineering, information science, or MIS also should enjoy favorable prospects for employment, particularly if they have supplemented their formal education with practical experience. Because employers continue to seek computer specialists who can combine strong technical skills with good interpersonal and business skills, graduates with non-computer-science degrees, but who have had courses in computer programming, systems analysis, and other information technology areas, also should continue to find jobs in these computer fields. In fact, individuals with the right experience and training can work in these computer occupations regardless of their college major or level of formal education.

Earnings

Median annual earnings of computer systems analysts were \$62,890 in 2002. The middle 50 percent earned between \$49,500 and \$78,350 a year. The lowest 10 percent earned less than \$39,270, and the highest 10 percent earned more than \$93,400. Median annual earnings in the industries employing the largest numbers of computer systems analysts in 2002 were as follows:

Federal Government	\$68,370
Computer systems design and related services	67,690
Data processing, hosting, and related services	64,560
Management of companies and enterprises	63,390
Insurance carriers	59,510

Median annual earnings of database administrators were \$55,480 in 2002. The middle 50 percent earned between \$40,550 and \$75,100. The lowest 10 percent earned less than \$30,750, and the highest 10 percent earned more than \$92,910. In 2002, median annual earnings of database administrators employed in computer system design and related services were \$66,650, and, for those in management of companies and enterprises, earnings were \$59,620.

Median annual earnings of network systems and data communication analysts were \$58,420 in 2002. The middle 50 percent earned between \$44,850 and \$74,290. The lowest 10 percent earned less than \$34,880, and the highest 10 percent earned more than \$92,110. Median annual earnings in the industries employing the largest numbers of network systems and data communications analysts in 2002 were as follows:

Computer systems design and related services	\$65,800
Management of companies and enterprises	63,050
State government	45,110

Median annual earnings of computer and information scientists, research, were \$77,760 in 2002. The middle 50 percent earned between \$58,630 and \$98,490. The lowest 10 percent earned less than \$42,890, and the highest 10 percent earned more than \$121,650. Median annual earnings of computer and information scientists employed in computer systems design and related services in 2002 were \$78,730.

Median annual earnings of all other computer specialists were \$54,070 in 2002. Median annual earnings of all other computer specialists employed in computer system design and related services were \$49,590, and, for those in scientific research and development services, earnings were \$70,150 in 2002.

According to the National Association of Colleges and Employers, starting offers for graduates with a master's degree in computer science averaged \$62,806 in 2003. Starting offers averaged \$47,109 for graduates with a bachelor's degree in computer science; \$45,346 for those with a degree in computer programming; \$41,118 for those with a degree in computer systems analysis; \$40,556 for those with a degree in management information systems; and \$38,282 for those with a degree in information sciences and systems.

According to Robert Half International, starting salaries in 2003 ranged from \$69,750 to \$101,750 for database administrators. Salaries for networking and Internet-related occupations ranged from \$45,500 to \$65,750 for LAN administrators and from \$51,250 to \$73,750 for Intranet developers. Starting salaries for security professionals ranged from \$62,500 to \$91,750 in 2003.

Sources of Additional Information

Further information about computer careers is available from any of the following organizations:

- Association for Computing Machinery (ACM), 1515 Broadway, New York, NY 10036. Internet: <http://www.acm.org>

- Institute of Electrical and Electronics Engineers Computer Society, Headquarters Office, 1730 Massachusetts Ave. NW., Washington, DC 20036-1992. Internet: <http://www.computer.org>
- National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: <http://www.nwcet.org>

Teachers—Preschool, Kindergarten, Elementary, Middle, and Secondary

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Significant Points

- Public school teachers must have at least a bachelor’s degree, complete an approved teacher education program, and be licensed.
- Many States offer alternative licensing programs to attract people into teaching, especially for hard-to-fill positions.
- Excellent job opportunities are expected as a large number of teachers retire over the next 10 years, particularly at the secondary school level; opportunities will vary somewhat by geographic area and subject taught.

Nature of the Work

Teachers act as facilitators or coaches, using interactive discussions and “hands-on” approaches to help students learn and apply concepts in subjects such as science, mathematics, or English. They utilize “props” or “manipulatives” to help children understand abstract concepts, solve problems, and develop critical thought processes. For example, they teach the concepts of numbers or of addition and subtraction by playing board games. As the children get older, the teachers use more sophisticated materials, such as science apparatus, cameras, or computers.

To encourage collaboration in solving problems, students are increasingly working in groups to discuss and solve problems together. Preparing students for the future workforce is the major stimulus generating the changes in education. To be prepared, students must be able to interact with others, adapt to new technology, and think through problems logically. Teachers provide the tools and the environment for their students to develop these skills.

Preschool, kindergarten, and elementary school teachers play a vital role in the development of children. What children learn and experience during their early years can shape their views of themselves and the world and can affect their later success or failure in school, work, and their personal lives. Preschool, kindergarten, and elementary school teachers introduce children to mathematics, language, science, and social studies. They use games, music, artwork, films, books, computers, and other tools to teach basic skills.

Most **elementary school teachers** instruct one class of children in several subjects. In some schools, two or more teachers work as a team and are jointly responsible for a group of students in at least one subject. In other schools, a teacher may teach one special subject—usually music, art, reading, science, arithmetic, or physical

education—to a number of classes. A small but growing number of teachers instruct multilevel classrooms, with students at several different learning levels.

Middle school teachers and secondary school teachers help students delve more deeply into subjects introduced in elementary school and expose them to more information about the world. Middle and secondary school teachers specialize in a specific subject, such as English, Spanish, mathematics, history, or biology. They also can teach subjects that are career oriented. **Vocational education teachers**, also referred to as career and technical or career-technology teachers, instruct and train students to work in a wide variety of fields, such as healthcare, business, auto repair, communications, and, increasingly, technology. They often teach courses that are in high demand by area employers, who may provide input into the curriculum and offer internships to students. Many vocational teachers play an active role in building and overseeing these partnerships. Additional responsibilities of middle and secondary school teachers may include career guidance and job placement, as well as follow-ups with students after graduation.

Teachers may use films, slides, overhead projectors, and the latest technology in teaching, including computers, telecommunication systems, and video discs. The use of computer resources, such as educational software and the Internet, exposes students to a vast range of experiences and promotes interactive learning. Through the Internet, students can communicate with students in other countries. Students also use the Internet for individual research projects and to gather information. Computers are used in other classroom activities as well, from solving math problems to learning English as a second language. Teachers also may use computers to record grades and perform other administrative and clerical duties. They must continually update their skills so that they can instruct and use the latest technology in the classroom.

Teachers often work with students from varied ethnic, racial, and religious backgrounds. With growing minority populations in most parts of the country, it is important for teachers to work effectively with a diverse student population. Accordingly, some schools offer training to help teachers enhance their awareness and understanding of different cultures. Teachers may also include multicultural programming in their lesson plans, to address the needs of all students, regardless of their cultural background.

Teachers design classroom presentations to meet students' needs and abilities. They also work with students individually. Teachers plan, evaluate, and assign lessons; prepare, administer, and grade tests; listen to oral presentations; and maintain classroom discipline. They observe and evaluate a student's performance and potential and increasingly are asked to use new assessment methods. For example, teachers may examine a portfolio of a student's artwork or writing in order to judge the student's overall progress. They then can provide additional assistance in areas in which a student needs help. Teachers also grade papers, prepare report cards, and meet with parents and school staff to discuss a student's academic progress or personal problems.

In addition to conducting classroom activities, teachers oversee study halls and homerooms, supervise extracurricular activities, and accompany students on field trips. They may identify students with physical or mental problems and refer the students to the proper authorities. Secondary school teachers occasionally assist

students in choosing courses, colleges, and careers. Teachers also participate in education conferences and workshops.

In recent years, site-based management, which allows teachers and parents to participate actively in management decisions regarding school operations, has gained popularity. In many schools, teachers are increasingly involved in making decisions regarding the budget, personnel, textbooks, curriculum design, and teaching methods.

Working Conditions

Seeing students develop new skills and gain an appreciation of knowledge and learning can be very rewarding. However, teaching may be frustrating when one is dealing with unmotivated or disrespectful students. Occasionally, teachers must cope with unruly behavior and violence in the schools. Teachers may experience stress in dealing with large classes, students from disadvantaged or multicultural backgrounds, or heavy workloads. Inner-city schools in particular, may be run down and lack the amenities of schools in wealthier communities. Accountability standards also may increase stress levels, with teachers expected to produce students who are able to exhibit satisfactory performance on standardized tests in core subjects.

Teachers are sometimes isolated from their colleagues because they work alone in a classroom of students. However, some schools allow teachers to work in teams and with mentors to enhance their professional development.

Including school duties performed outside the classroom, many teachers work more than 40 hours a week. Part-time schedules are more common among preschool and kindergarten teachers. Although some school districts have gone to all-day kindergartens, most kindergarten teachers still teach two kindergarten classes a day. Most teachers work the traditional 10-month school year with a 2-month vacation during the summer. During the vacation break, those on the 10-month schedule may teach in summer sessions, take other jobs, travel, or pursue personal interests. Many enroll in college courses or workshops to continue their education. Teachers in districts with a year-round schedule typically work 8 weeks, are on vacation for 1 week, and have a 5-week midwinter break. Preschool teachers working in daycare settings often work year round.

Most States have tenure laws that prevent teachers from being fired without just cause and due process. Teachers may obtain tenure after they have satisfactorily completed a probationary period of teaching, normally 3 years. Tenure does not absolutely guarantee a job, but it does provide some security.

Employment

Preschool, kindergarten, elementary school, middle school, and secondary school teachers, except special education, held about 3.8 million jobs in 2002. Of the teachers in those jobs, about 1.5 million were elementary school teachers, 1.1 million were secondary school teachers, 602,000 were middle school teachers, 424,000 were preschool teachers, and 168,000 were kindergarten teachers. The majority of kindergarten, elementary school, middle school, and secondary school teachers, except special education worked in local government educational services. About 10 percent worked for private schools. Preschool teachers, except special

education were most often employed in child daycare services (63 percent), religious organizations (9 percent), local government educational services (9 percent), and private educational services (7 percent). Employment of teachers is geographically distributed much the same as the population is.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require public school teachers to be licensed. Licensure is not required for teachers in private schools. Usually licensure is granted by the State Board of Education or a licensure advisory committee. Teachers may be licensed to teach the early childhood grades (usually preschool through grade 3); the elementary grades (grades 1 through 6 or 8); the middle grades (grades 5 through 8); a secondary-education subject area (usually grades 7 through 12); or a special subject, such as reading or music (usually grades kindergarten through 12).

Requirements for regular licenses to teach kindergarten through grade 12 vary by State. However, all States require general education teachers to have a bachelor's degree and to have completed an approved teacher training program with a prescribed number of subject and education credits, as well as supervised practice teaching. Some States also require technology training and the attainment of a minimum grade point average. A number of States require that teachers obtain a master's degree in education within a specified period after they begin teaching.

Almost all States require applicants for a teacher's license to be tested for competency in basic skills, such as reading and writing, and in teaching. Almost all also require the teacher to exhibit proficiency in his or her subject. Nowadays, school systems are moving toward implementing performance-based systems for licensure, which usually require the teacher to demonstrate satisfactory teaching performance over an extended period in order to obtain a provisional license, in addition to passing an examination in one's subject. Most States require continuing education for renewal of the teacher's license. Many States have reciprocity agreements that make it easier for teachers licensed in one State to become licensed in another.

Many States offer alternative licensure programs for teachers who have bachelor's degrees in the subject they will teach, but who lack the necessary education courses required for a regular license. Alternative licensure programs originally were designed to ease shortages of teachers of certain subjects, such as mathematics and science. The programs have expanded to attract other people into teaching, including recent college graduates and those changing from another career to teaching. In some programs, individuals begin teaching quickly under provisional licensure. After working under the close supervision of experienced educators for 1 or 2 years while taking education courses outside school hours, they receive regular licensure if they have progressed satisfactorily. In other programs, college graduates who do not meet licensure requirements take only those courses that they lack and then become licensed. This approach may take 1 or 2 semesters of full-time study. States may issue emergency licenses to individuals who do not meet the requirements for a regular license when schools cannot attract enough qualified teachers to fill positions. Teachers who need to be licensed may enter programs that grant a master's degree in education, as well as a license.

In many States, vocational teachers have many of the same requirements for teaching as their academic counterparts. However, because knowledge and experience in a particular field are important criteria for the job, some States will license vocational education teachers without a bachelor's degree, provided they can demonstrate expertise in their field. A minimum number of hours in education courses may also be required.

Licensing requirements for preschool teachers also vary by State. Requirements for public preschool teachers are generally higher than those for private preschool teachers. Some States require a bachelor's degree in early childhood education, others require an associate's degree, and still others require certification by a nationally recognized authority. The Child Development Associate (CDA) credential, the most common type of certification, requires a mix of classroom training and experience working with children, along with an independent assessment of an individual's competence.

In some cases, teachers of kindergarten through high school may attain professional certification in order to demonstrate competency beyond that required for a license. The National Board for Professional Teaching Standards offers a voluntary national certification. To become nationally accredited, experienced teachers must prove their aptitude by compiling a portfolio showing their work in the classroom and by passing a written assessment and evaluation of their teaching knowledge. Currently, teachers may become certified in a variety of areas, based on the age of the students and, in some cases, the subject taught. For example, teachers may obtain a certificate for teaching English language arts to early adolescents (aged 11 to 15), or they may become certified as early childhood generalists. All States recognize national certification, and many States and school districts provide special benefits to teachers holding such certification. Benefits typically include higher salaries and reimbursement for continuing education and certification fees. In addition, many States allow nationally certified teachers to carry a license from one State to another.

The National Council for Accreditation of Teacher Education currently accredits more than 550 teacher education programs across the United States. Generally, 4-year colleges require students to wait until their sophomore year before applying for admission to teacher education programs. Traditional education programs for kindergarten and elementary school teachers include courses—designed specifically for those preparing to teach—in mathematics, physical science, social science, music, art, and literature, as well as prescribed professional education courses, such as philosophy of education, psychology of learning, and teaching methods. Aspiring secondary school teachers most often major in the subject they plan to teach while also taking a program of study in teacher preparation. Teacher education programs are now required to include classes in the use of computers and other technologies in order to maintain their accreditation. Most programs require students to perform a student-teaching internship.

Many States now offer professional development schools—partnerships between universities and elementary or secondary schools. Students enter these 1-year programs after completion of their bachelor's degree. Professional development schools merge theory with practice and allow the student to experience a year of teaching firsthand, under professional guidance.

In addition to being knowledgeable in their subject, teachers must have the ability to communicate, inspire trust and confidence, and motivate students, as well as understand the students' educational and emotional needs. Teachers must be able to recognize and respond to individual and cultural differences in students and employ different teaching methods that will result in higher student achievement. They should be organized, dependable, patient, and creative. Teachers also must be able to work cooperatively and communicate effectively with other teachers, support staff, parents, and members of the community.

With additional preparation, teachers may move into positions as school librarians, reading specialists, curriculum specialists, or guidance counselors. Teachers may become administrators or supervisors, although the number of these positions is limited and competition can be intense. In some systems, highly qualified, experienced teachers can become senior or mentor teachers, with higher pay and additional responsibilities. They guide and assist less experienced teachers while keeping most of their own teaching responsibilities. Preschool teachers usually work their way up from assistant teacher, to teacher, to lead teacher—who may be responsible for the instruction of several classes—and, finally, to director of the center. Preschool teachers with a bachelor's degree frequently are qualified to teach kindergarten through grade 3 as well. Teaching at these higher grades often results in higher pay.

Job Outlook

Job opportunities for teachers over the next 10 years will vary from good to excellent, depending on the locality, grade level, and subject taught. Most job openings will be attributable to the expected retirement of a large number of teachers. In addition, relatively high rates of turnover, especially among beginning teachers employed in poor, urban schools, also will lead to numerous job openings for teachers. Competition for qualified teachers among some localities will likely continue, with schools luring teachers from other States and districts with bonuses and higher pay.

Through 2012, overall student enrollments, a key factor in the demand for teachers, are expected to rise more slowly than in the past. As the children of the baby-boom generation get older, smaller numbers of young children will enter school behind them, resulting in average employment growth for all teachers, from preschool through secondary grades. Projected enrollments will vary by region. Fast-growing States in the South and West—particularly California, Texas, Georgia, Idaho, Hawaii, Alaska, and New Mexico—will experience the largest enrollment increases. Enrollments in the Northeast and Midwest are expected to hold relatively steady or decline. The job market for teachers also continues to vary by school location and by subject taught. Many inner cities—often characterized by overcrowded, ill-equipped schools and higher-than-average poverty rates—and rural areas—characterized by their remote location and relatively low salaries—have difficulty attracting and retaining enough teachers, so job prospects should be better in these areas than in suburban districts. Currently, many school districts have difficulty hiring qualified teachers in some subject areas—mathematics, science (especially chemistry and physics), bilingual education, and foreign languages. Qualified vocational teachers, at both the middle school and secondary school levels, also are currently in demand in a variety of fields. Specialties that have an adequate number of qualified teachers include general elementary education, physical education, and social studies.

Teachers who are geographically mobile and who obtain licensure in more than one subject should have a distinct advantage in finding a job. Increasing enrollments of minorities, coupled with a shortage of minority teachers, should cause efforts to recruit minority teachers to intensify. In addition, the number of non-English-speaking students has grown dramatically, creating demand for bilingual teachers and for those who teach English as a second language. The number of teachers employed is dependent as well on State and local expenditures for education and on the enactment of legislation to increase the quality of education. A number of initiatives, such as reduced class size (primarily in the early elementary grades), mandatory preschool for 4-year-olds, and all-day kindergarten, have been implemented in a few States, but not nationwide. Additional teachers—particularly preschool and early elementary school teachers—will be needed if States or localities implement any of these measures. At the Federal level, legislation that is likely to affect teachers recently was put into place with the enactment of the No Child Left Behind Act. Although the full impact of this act is not yet known, its emphasis on ensuring that all schools hire and retain only qualified teachers, may lead to an increase in funding for schools that currently lack such teachers.

The supply of teachers is expected to increase in response to reports of improved job prospects, better pay, more teacher involvement in school policy, and greater public interest in education. In recent years, the total number of bachelor's and master's degrees granted in education has increased steadily. Because of a shortage of teachers in certain locations, and in anticipation of the loss of a number of teachers to retirement, many States have implemented policies that will encourage more students to become teachers. In addition, more teachers may be drawn from a reserve pool of career changers, substitute teachers, and teachers completing alternative certification programs.

Earnings

Median annual earnings of kindergarten, elementary, middle, and secondary school teachers ranged from \$39,810 to \$44,340 in 2002; the lowest 10 percent earned \$24,960 to \$29,850; the top 10 percent earned \$62,890 to \$68,530. Median earnings for preschool teachers were \$19,270.

According to the American Federation of Teachers, beginning teachers with a bachelor's degree earned an average of \$30,719 in the 2001–02 school year. The estimated average salary of all public elementary and secondary school teachers in the 2001–02 school year was \$44,367. Private school teachers generally earn less than public school teachers.

In 2002, more than half of all elementary, middle, and secondary school teachers belonged to unions—mainly the American Federation of Teachers and the National Education Association—that bargain with school systems over wages, hours, and other terms and conditions of employment. Fewer preschool and kindergarten teachers were union members—about 15 percent in 2002.

Teachers can boost their salary in a number of ways. In some schools, teachers receive extra pay for coaching sports and working with students in extracurricular activities. Getting a master's degree or national certification often results in a raise in pay, as does acting as a mentor. Some teachers earn extra income during the summer by teaching summer school or performing other jobs in the school system.

Sources of Additional Information

Information on licensure or certification requirements and approved teacher training institutions is available from local school systems and State departments of education.

Information on the teaching profession and on how to become a teacher can be obtained from Recruiting New Teachers, Inc., 385 Concord Ave., Suite 103, Belmont, MA 02478. Internet: <http://www.rnt.org>

This organization also sponsors another Internet site that provides helpful information on becoming a teacher: <http://www.recruitingteachers.org>

Information on teachers' unions and education-related issues may be obtained from any of the following sources:

- American Federation of Teachers, 555 New Jersey Ave. NW., Washington, DC 20001.
- National Education Association, 1201 16th St. NW., Washington, DC 20036.

A list of institutions with accredited teacher education programs can be obtained from National Council for Accreditation of Teacher Education, 2010 Massachusetts Ave. NW., Suite 500, Washington, DC 20036-1023. Internet: <http://www.ncate.org>

For information on vocational education and vocational education teachers, contact Association for Career and Technical Education, 1410 King St., Alexandria, VA 22314. Internet: <http://www.acteonline.org>

For information on teachers and the No Child Left Behind Act, contact U.S. Department of Education, 400 Maryland Avenue, SW., Washington, DC, 20202. Internet: <http://www.ed.gov>

Significant Points

- Police work can be dangerous and stressful.
- Civil service regulations govern the appointment of police and detectives.
- Competition should remain keen for higher paying jobs with State and Federal agencies and police departments in affluent areas; opportunities will be better in local and special police departments that offer relatively low salaries or in urban communities where the crime rate is relatively high.
- Applicants with college training in police science or military police experience should have the best opportunities.

Nature of the Work

People depend on police officers and detectives to protect their lives and property. Law enforcement officers, some of whom are State or Federal special agents or inspectors, perform these duties in a variety of ways, depending on the size and type of their organization. In most jurisdictions, they are expected to exercise authority when necessary, whether on or off duty.

Uniformed police officers who work in municipal police departments of various sizes, small communities, and rural areas have general law enforcement duties including maintaining regular patrols and responding to calls for service. They may direct traffic at the scene of a fire, investigate a burglary, or give first aid to an accident victim. In large police departments, officers usually are assigned to a specific type of duty. Many urban police agencies are becoming more involved in community policing—a practice in which an officer builds relationships with the citizens of local neighborhoods and mobilizes the public to help fight crime.

Police agencies are usually organized into geographic districts, with uniformed officers assigned to patrol a specific area, such as part of the business district or outlying residential neighborhoods. Officers may work alone, but in large agencies they often patrol with a partner. While on patrol, officers attempt to become thoroughly familiar with their patrol area and remain alert for anything unusual. Suspicious circumstances and hazards to public safety are investigated or noted, and officers are dispatched to individual calls for assistance within their district. During their shift, they may identify, pursue, and arrest suspected criminals, resolve problems within the community, and enforce traffic laws.

Public college and university police forces, public school district police, and agencies serving transportation systems and facilities are examples of special police agencies. These agencies have special geographic jurisdictions or enforcement responsibilities in the United States. Most sworn personnel in special agencies are uniformed officers, a smaller number are investigators.

Some police officers specialize in such diverse fields as chemical and microscopic analysis, training and firearms instruction, or handwriting and fingerprint identification. Others work with special units such as horseback, bicycle, motorcycle or harbor patrol, canine corps, or special weapons and tactics (SWAT) or emergency response teams. A few local and special law enforcement officers primarily perform

jail-related duties or work in courts. Regardless of job duties or location, police officers and detectives at all levels must write reports and maintain meticulous records that will be needed if they testify in court.

Detectives are plainclothes investigators who gather facts and collect evidence for criminal cases. Some are assigned to interagency task forces to combat specific types of crime. They conduct interviews, examine records, observe the activities of suspects, and participate in raids or arrests. Detectives and State and Federal agents and inspectors usually specialize in one of a wide variety of violations such as homicide or fraud. They are assigned cases on a rotating basis and work on them until an arrest and conviction occurs or the case is dropped.

The Federal Government maintains a high profile in many areas of law enforcement. **Federal Bureau of Investigation (FBI) agents** are the Government's principal investigators, responsible for investigating violations of more than 260 statutes and conducting sensitive national security investigations. Agents may conduct surveillance, monitor court-authorized wiretaps, examine business records, investigate white-collar crime, track the interstate movement of stolen property, collect evidence of espionage activities, or participate in sensitive undercover assignments. The FBI investigates organized crime, public corruption, financial crime, fraud against the government, bribery, copyright infringement, civil rights violations, bank robbery, extortion, kidnapping, air piracy, terrorism, espionage, interstate criminal activity, drug trafficking, and other violations of Federal statutes.

Working Conditions

Police work can be very dangerous and stressful. In addition to the obvious dangers of confrontations with criminals, officers need to be constantly alert and ready to deal appropriately with a number of other threatening situations. Many law enforcement officers witness death and suffering resulting from accidents and criminal behavior. A career in law enforcement may take a toll on officers' private lives.

Uniformed officers, detectives, agents, and inspectors are usually scheduled to work 40-hour weeks, but paid overtime is common. Shift work is necessary because protection must be provided around the clock. Junior officers frequently work weekends, holidays, and nights. Police officers and detectives are required to work at any time their services are needed and may work long hours during investigations. In most jurisdictions, whether on or off duty, officers are expected to be armed and to exercise their arrest authority whenever necessary.

The jobs of some Federal agents such as U.S. Secret Service and DEA special agents require extensive travel, often on very short notice. They may relocate a number of times over the course of their careers. Some special agents in agencies such as the U.S. Border Patrol work outdoors in rugged terrain for long periods and in all kinds of weather.

Employment

Police and detectives held about 840,000 jobs in 2002. About 81 percent were employed by local governments. State police agencies employed about 11 percent and various Federal agencies employed about 6 percent. A small proportion worked

for educational services, rail transportation, and contract investigation and security services.

According to the U.S. Bureau of Justice Statistics, police and detectives employed by local governments primarily worked in cities with more than 25,000 inhabitants. Some cities have very large police forces, while thousands of small communities employ fewer than 25 officers each.

Training, Other Qualifications, and Advancement

Civil service regulations govern the appointment of police and detectives in practically all States, large municipalities, and special police agencies, as well as in many smaller ones. Candidates must be U.S. citizens, usually at least 20 years of age, and must meet rigorous physical and personal qualifications. In the Federal Government, candidates must be at least 21 years of age but less than 37 years of age at the time of appointment. Physical examinations for entrance into law enforcement often include tests of vision, hearing, strength, and agility. Eligibility for appointment usually depends on performance in competitive written examinations and previous education and experience. In larger departments, where the majority of law enforcement jobs are found, applicants usually must have at least a high school education. Federal and State agencies typically require a college degree. Candidates should enjoy working with people and meeting the public.

Because personal characteristics such as honesty, sound judgment, integrity, and a sense of responsibility are especially important in law enforcement, candidates are interviewed by senior officers, and their character traits and backgrounds are investigated. In some agencies, candidates are interviewed by a psychiatrist or a psychologist, or given a personality test. Most applicants are subjected to lie detector examinations or drug testing. Some agencies subject sworn personnel to random drug testing as a condition of continuing employment.

Before their first assignments, officers usually go through a period of training. In State and large local departments, recruits get training in their agency's police academy, often for 12 to 14 weeks. In small agencies, recruits often attend a regional or State academy. Training includes classroom instruction in constitutional law and civil rights, State laws and local ordinances, and accident investigation. Recruits also receive training and supervised experience in patrol, traffic control, use of firearms, self-defense, first aid, and emergency response. Police departments in some large cities hire high school graduates who are still in their teens as police cadets or trainees. They do clerical work and attend classes, usually for 1 to 2 years, at which point they reach the minimum age requirement and may be appointed to the regular force.

Police officers usually become eligible for promotion after a probationary period ranging from 6 months to 3 years. In a large department, promotion may enable an officer to become a detective or specialize in one type of police work, such as working with juveniles. Promotions to corporal, sergeant, lieutenant, and captain usually are made according to a candidate's position on a promotion list, as determined by scores on a written examination and on-the-job performance.

To be considered for appointment as an FBI agent, an applicant either must be a graduate of an accredited law school or a college graduate with a major in

accounting, fluency in a foreign language, or 3 years of related full-time work experience. All new agents undergo 16 weeks of training at the FBI academy on the U.S. Marine Corps base in Quantico, Virginia.

Applicants for special agent jobs with the U.S. Secret Service and the Bureau of Alcohol, Tobacco, Firearms, and Explosives must have a bachelor's degree or a minimum of 3 years' related work experience. Prospective special agents undergo 10 weeks of initial criminal investigation training at the Federal Law Enforcement Training Center in Glynco, Georgia, and another 17 weeks of specialized training with their particular agencies.

Applicants for special agent jobs with the U.S. Drug Enforcement Administration (DEA) must have a college degree and either 1 year of experience conducting criminal investigations, 1 year of graduate school, or have achieved at least a 2.95 grade point average while in college. DEA special agents undergo 14 weeks of specialized training at the FBI Academy in Quantico, Virginia.

U.S. Border Patrol agents must be U.S. citizens, younger than 37 years of age at the time of appointment, possess a valid driver's license, and pass a three-part examination on reasoning and language skills. A bachelor's degree or previous work experience that demonstrates the ability to handle stressful situations, make decisions, and take charge is required for a position as a Border Patrol agent. Applicants may qualify through a combination of education and work experience.

Postal inspectors must have a bachelor's degree and 1 year of related work experience. It is desirable that they have one of several professional certifications, such as that of certified public accountant. They also must pass a background suitability investigation, meet certain health requirements, undergo a drug screening test, possess a valid State driver's license, and be a U.S. citizen between 21 and 36 years of age when hired.

Law enforcement agencies are encouraging applicants to take postsecondary school training in law enforcement-related subjects. Many entry-level applicants for police jobs have completed some formal postsecondary education and a significant number are college graduates. Many junior colleges, colleges, and universities offer programs in law enforcement or administration of justice. Other courses helpful in preparing for a career in law enforcement include accounting, finance, electrical engineering, computer science, and foreign languages. Physical education and sports are helpful in developing the competitiveness, stamina, and agility needed for many law enforcement positions. Knowledge of a foreign language is an asset in many Federal agencies and urban departments.

Continuing training helps police officers, detectives, and special agents improve their job performance. Through police department academies, regional centers for public safety employees established by the States, and Federal agency training centers, instructors provide annual training in self-defense tactics, firearms, use-of-force policies, sensitivity and communications skills, crowd-control techniques, relevant legal developments, and advances in law enforcement equipment. Many agencies pay all or part of the tuition for officers to work toward degrees in criminal justice, police science, administration of justice, or public administration, and pay higher salaries to those who earn such a degree.

Job Outlook

The opportunity for public service through law enforcement work is attractive to many because the job is challenging and involves much personal responsibility. Furthermore, law enforcement officers in many agencies may retire with a pension after 20 or 25 years of service, allowing them to pursue a second career while still in their 40s. Because of relatively attractive salaries and benefits, the number of qualified candidates exceeds the number of job openings in Federal law enforcement agencies and in most State police departments—resulting in increased hiring standards and selectivity by employers. Competition should remain keen for higher paying jobs with State and Federal agencies and police departments in more affluent areas. Opportunities will be better in local and special police departments, especially in departments that offer relatively low salaries, or in urban communities where the crime rate is relatively high. Applicants with college training in police science, military police experience, or both should have the best opportunities.

Employment of police and detectives is expected to grow faster than the average for all occupations through 2012. A more security-conscious society and concern about drug-related crimes should contribute to the increasing demand for police services.

The level of government spending determines the level of employment for police and detectives. The number of job opportunities, therefore, can vary from year to year and from place to place. Layoffs, on the other hand, are rare because retirements enable most staffing cuts to be handled through attrition. Trained law enforcement officers who lose their jobs because of budget cuts usually have little difficulty finding jobs with other agencies. The need to replace workers who retire, transfer to other occupations, or stop working for other reasons will be the source of many job openings.

Earnings

Police and sheriff's patrol officers had median annual earnings of \$42,270 in 2002. The middle 50 percent earned between \$32,300 and \$53,500. The lowest 10 percent earned less than \$25,270, and the highest 10 percent earned more than \$65,330. Median annual earnings were \$47,090 in State government, \$42,020 in local government, and \$41,600 in Federal Government.

In 2002, median annual earnings of police and detective supervisors were \$61,010. The middle 50 percent earned between \$47,210 and \$74,610. The lowest 10 percent earned less than \$36,340, and the highest 10 percent earned more than \$90,070. Median annual earnings were \$78,230 in Federal Government, \$64,410 in State government, and \$59,830 in local government.

In 2002, median annual earnings of detectives and criminal investigators were \$51,410. The middle 50 percent earned between \$39,010 and \$65,980. The lowest 10 percent earned less than \$31,010, and the highest 10 percent earned more than \$80,380. Median annual earnings were \$66,500 in Federal Government, \$47,700 in local government, and \$46,600 in State government.

Federal law provides special salary rates to Federal employees who serve in law enforcement. Additionally, Federal special agents and inspectors receive law enforcement availability pay (LEAP)—equal to 25 percent of the agent's grade and

step—awarded because of the large amount of overtime that these agents are expected to work. For example, in 2003 FBI agents enter Federal service as GS-10 employees on the pay scale at a base salary of \$39,115, yet earned about \$48,890 a year with availability pay. They can advance to the GS-13 grade level in field nonsupervisory assignments at a base salary of \$61,251, which is worth \$76,560 with availability pay. FBI supervisory, management, and executive positions in grades GS-14 and GS-15 pay a base salary of about \$72,381 or \$85,140 a year, respectively, and equaled \$90,480 or \$106,430 per year including availability pay. Salaries were slightly higher in selected areas where the prevailing local pay level was higher. Because Federal agents may be eligible for a special law enforcement benefits package, applicants should ask their recruiter for more information.

According to the International City-County Management Association’s annual Police and Fire Personnel, Salaries, and Expenditures Survey, average salaries for sworn full-time positions in 2002 were as follows:

	Minimum annual base salary	Maximum annual base salary
Police chief	\$68,337	\$87,037
Deputy chief	59,790	75,266
Police captain	56,499	70,177
Police lieutenant	52,446	63,059
Police sergeant	46,805	55,661
Police corporal	39,899	49,299

Total earnings for local, State, and special police and detectives frequently exceed the stated salary because of payments for overtime, which can be significant. In addition to the common benefits—paid vacation, sick leave, and medical and life insurance—most police and sheriffs’ departments provide officers with special allowances for uniforms. Because police officers usually are covered by liberal pension plans, many retire at half-pay after 20 or 25 years of service.

Sources of Additional Information

Information about entrance requirements may be obtained from Federal, State, and local law enforcement agencies.

Further information about qualifications for employment as a FBI Special Agent is available from the nearest State FBI office. The address and phone number are listed in the local telephone directory. Internet: <http://www.fbi.gov>

Information on career opportunities, qualifications, and training for U.S. Secret Service Special Agents is available from the Secret Service Personnel Division at (202) 406-5800, (888) 813-8777 or (888) 813-USSS. Internet: <http://www.treas.gov/usss>

Information about qualifications for employment as a DEA Special Agent is available from the nearest DEA office, or call (800) DEA-4288. Internet: <http://www.usdoj.gov/dea>

Information about career opportunities, qualifications, and training to become a deputy marshal is available from U.S. Marshals Service, Human Resources Division—Law Enforcement Recruiting, Washington, DC 20530-1000. Internet: <http://www.usdoj.gov/marshals>

For information on operations and career opportunities in the U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives operations, contact U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives Personnel Division, 650 Massachusetts Ave. NW., Room 4100, Washington, DC 20226. Internet: <http://www.atf.treas.gov>

Information about careers in U.S. Customs and Border Protection is available from U.S. Customs and Border Protection, 1300 Pennsylvania Ave., NW., Washington, DC 20229. Internet: <http://www.cbp.gov>

Purchasing Managers, Buyers, and Agents

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Significant Points

- Forty-two percent are employed in wholesale trade or manufacturing establishments.
- Some firms promote qualified employees to these positions, while other employers recruit college graduates; regardless of academic preparation, new employees need 1 to 5 years to learn the specifics of their employer's business.
- Overall employment is expected to be slower than the average, but the projected change in employment varies significantly by occupational specialty.
- Opportunities should be best for those with a college degree.

Nature of the Work

Purchasing managers, buyers, and purchasing agents seek to obtain the highest quality merchandise at the lowest possible purchase cost for their employers. In general, **purchasers** buy goods and services for use by their company or organization, whereas **buyers** typically buy items for resale. Purchasers and buyers determine which commodities or services are best, choose the suppliers of the product or service, negotiate the lowest price, and award contracts that ensure that the correct amount of the product or service is received at the appropriate time. In order to accomplish these tasks successfully, purchasing managers, buyers, and purchasing agents study sales records and inventory levels of current stock, identify foreign and domestic suppliers, and keep abreast of changes affecting both the supply of, and demand for, needed products and materials.

Purchasing managers, buyers, and purchasing agents evaluate suppliers based on price, quality, service support, availability, reliability, and selection. To assist them in their search for the right suppliers, they review catalogs, industry and company publications, directories, and trade journals. Much of this information is now available on the Internet. They research the reputation and history of the suppliers and may advertise anticipated purchase actions in order to solicit bids. At meetings, trade shows, conferences, and suppliers' plants and distribution centers, they examine products and services, assess a supplier's production and distribution

capabilities, and discuss other technical and business considerations that influence the purchasing decision. Once all of the necessary information on suppliers is gathered, orders are placed and contracts are awarded to those suppliers who meet the purchaser's needs. Contracts often are for several years and may stipulate the price or a narrow range of prices, allowing purchasers to reorder as necessary. Other specific job duties and responsibilities of purchasing managers, buyers, and purchasing agents vary by employer and by the type of commodities or services to be purchased.

Purchasing specialists employed by government agencies or manufacturing firms usually are called purchasing directors, managers, or agents; buyers or industrial buyers; or contract specialists. These workers acquire materials, parts, machines, supplies, services, and other inputs to the production of a final product. Some purchasing managers specialize in negotiating and supervising supply contracts, and are called contract or supply managers. Purchasing agents and managers obtain items ranging from raw materials, fabricated parts, machinery, and office supplies to construction services and airline tickets. The flow of work—or even the entire production process—can be slowed or halted if the right materials, supplies, or equipment are not on hand when needed. To be effective, purchasing specialists must have a working technical knowledge of the goods or services to be purchased.

In large industrial organizations, a distinction often is drawn between the work of a buyer or purchasing agent and that of a purchasing manager. Purchasing agents and buyers commonly focus on routine purchasing tasks, often specializing in a commodity or group of related commodities, such as steel, lumber, cotton, grains, fabricated metal products, or petroleum products. Purchasing agents usually track market conditions, price trends, or futures markets. Purchasing managers usually handle the more complex or critical purchases and may supervise a group of purchasing agents handling other goods and services. Whether a person is titled purchasing manager, buyer, or purchasing agent depends more on specific industry and employer practices than on specific job duties.

Changing business practices have altered the traditional roles of purchasing or supply management specialists in many industries. For example, manufacturing companies increasingly involve workers in this occupation at most stages of product development because of their ability to forecast a part's or material's cost, availability, and suitability for its intended purpose. Furthermore, potential problems with the supply of materials may be avoided by consulting the purchasing department in the early stages of product design.

Businesses also might enter into integrated supply contracts. These contracts increase the importance of selecting the right supplier, because agreements are larger in scope and longer in duration. Integrated supply incorporates all members of the supply chain, including the supplier, transportation companies, and the retailer. A major responsibility of most purchasers is to work out problems that may occur with a supplier, because the success of the relationship affects the buying firm's performance.

Purchasing specialists often work closely with other employees in their own organization when deciding on purchases, an arrangement sometimes called team buying. For example, before submitting an order, they may discuss the design of custom-made products with company design engineers, talk about problems

involving the quality of purchased goods with quality assurance engineers and production supervisors, or mention shipment problems to managers in the receiving department.

Contract specialists and managers at various levels of government award contracts for an array of items, including office and building supplies, services for the public, and construction projects. For example, they may oversee the contract for cleaning services of a government office building to verify that the work is being done on schedule and on budget, even though the cleaners are not government employees. They may use sealed bids to award contracts, but usually establish negotiated agreements for complex items. Often, purchasing specialists in government place solicitations for services and accept bids and offers through the Internet. Government purchasing agents and managers must follow strict laws and regulations in their work, in order to avoid any appearance of impropriety. These legal requirements are occasionally changed, so agents and contract specialists must keep abreast of the latest regulations.

Purchasing specialists who buy finished goods for resale are employed by wholesale and retail establishments, where they commonly are known as buyers or merchandise managers. Wholesale and retail buyers are an integral part of a complex system of distribution and merchandising that caters to the vast array of consumer needs and desires. Wholesale buyers purchase goods directly from manufacturers or from other wholesale firms for resale to retail firms, commercial establishments, institutions, and other organizations. In retail firms, buyers purchase goods from wholesale firms or directly from manufacturers for resale to the public. Buyers largely determine which products their establishment will sell. Therefore, it is essential that they have the ability to predict what will appeal to consumers. They must constantly stay informed of the latest trends, because failure to do so could jeopardize profits and the reputation of their company. Buyers also follow ads in newspapers and other media to check competitors' sales activities, and they watch general economic conditions to anticipate consumer buying patterns. Buyers working for large and medium-sized firms usually specialize in acquiring one or two lines of merchandise, whereas buyers working for small stores may purchase the establishment's complete inventory.

The use of private-label merchandise and the consolidation of buying departments have increased the responsibilities of retail buyers. Private-label merchandise, produced for a particular retailer, requires buyers to work closely with vendors to develop and obtain the desired product. The downsizing and consolidation of buying departments increases the demands placed on buyers because, although the amount of work remains unchanged, there are fewer people to accomplish it. The result is an increase in the workloads and levels of responsibility for all.

Many merchandise managers assist in the planning and implementation of sales promotion programs. Working with merchandise executives, they determine the nature of the sale and purchase items accordingly. Merchandise managers may work with advertising personnel to create an ad campaign. For example, they may determine in which media the advertisement will be placed—newspapers, direct mail, television, or some combination of all three. In addition, merchandise managers often visit the selling floor to ensure that goods are properly displayed. Often, assistant buyers are responsible for placing orders and checking shipments.

Computers continue to have a major effect on the jobs of purchasing managers, buyers, and purchasing agents. In manufacturing and service industries, computers handle most of the routine tasks, enabling purchasing workers to concentrate mainly on the analytical and qualitative aspects of the job. Computers are used to obtain instant and accurate product and price listings, to track inventory levels, to process orders, and to help determine when to make purchases. Computers also maintain lists of bids and offers, record the history of supplier performance, and issue purchase orders.

Computerized systems have dramatically simplified many of the acquisition functions and improved the efficiency of determining which products are selling. For example, cash registers connected to computers, known as point-of-sale terminals, allow organizations to maintain instant access to current sales and inventory records. The information contained therein can then be used to produce sales reports that reflect customer buying habits. The ability to find out quickly which products or combinations of products are selling well enables buyers and supply managers to increase sales and reduce costs. Buyers can gain instant access to the specifications for thousands of commodities, inventory records, and their customers' purchase records to avoid overpaying for goods and to avoid shortages of popular goods or surpluses of goods that do not sell as well. Firms are linked with manufacturers and wholesalers by electronic purchasing systems, the Internet, or Extranets. These systems permit faster selection, customization, and ordering of products, and they allow buyers to concentrate better on selecting goods and suppliers.

Working Conditions

Most purchasing managers, buyers, and purchasing agents work in comfortable offices. They frequently work more than the standard 40-hour week, because of special sales, conferences, or production deadlines. Evening and weekend work also is common, before holiday and back-to-school seasons for those working in retail trade. Consequently, many retail firms discourage the use of vacation time during peak periods.

Buyers and merchandise managers often work under great pressure. Because wholesale and retail stores are so competitive, buyers need physical stamina to keep up with the fast-paced nature of their work.

Many purchasing managers, buyers, and purchasing agents travel at least several days a month. Purchasers for worldwide manufacturing companies and large retailers, as well as buyers of high fashion, may travel outside the United States.

Employment

Purchasing managers, buyers, and purchasing agents held about 527,000 jobs in 2002. Forty-two percent worked in the wholesale trade and manufacturing industries, and another 15 percent worked in retail trade. The remainder worked mostly in service establishments, such as hospitals, or different levels of government. A small number were self-employed.

The following tabulation shows the distribution of employment by occupational specialty:

Purchasing agents, except wholesale, retail, and farm products	245,000
Wholesale and retail buyers, except farm products	155,000
Purchasing managers	108,000
Purchasing agents and buyers, farm products	19,000

Training, Other Qualifications, and Advancement

Qualified persons may begin as trainees, purchasing clerks, expeditors, junior buyers, or assistant buyers. Retail and wholesale firms prefer to hire applicants who have a college degree and who are familiar with the merchandise they sell and with wholesaling and retailing practices. Some retail firms promote qualified employees to assistant buyer positions; others recruit and train college graduates as assistant buyers. Most employers use a combination of methods.

Educational requirements tend to vary with the size of the organization. Large stores and distributors, especially those in wholesale and retail trade, prefer applicants who have completed a bachelor's degree program with a business emphasis. Many manufacturing firms put yet a greater emphasis on formal training, preferring applicants with a bachelor's or master's degree in engineering, business, economics, or one of the applied sciences. A master's degree is essential for advancement to many top-level purchasing manager jobs.

Regardless of academic preparation, new employees must learn the specifics of their employers' business. Training periods vary in length, with most lasting 1 to 5 years. In wholesale and retail establishments, most trainees begin by selling merchandise, supervising sales workers, checking invoices on material received, and keeping track of stock. As they progress, retail trainees are given increased buying-related responsibilities.

In manufacturing, new purchasing employees often are enrolled in company training programs and spend a considerable amount of time learning about their firm's operations and purchasing practices. They work with experienced purchasers to learn about commodities, prices, suppliers, and markets. In addition, they may be assigned to the production planning department to learn about the material requirements system and the inventory system the company uses to keep production and replenishment functions working smoothly.

Purchasing managers, buyers, and purchasing agents must know how to use both word processing and spreadsheet software, as well as the Internet. Other important qualities include the ability to analyze technical data in suppliers' proposals; good communication, negotiation, and mathematical skills; knowledge of supply-chain management; and the ability to perform financial analyses.

Persons who wish to become wholesale or retail buyers should be good at planning and decision-making and have an interest in merchandising. Anticipating consumer preferences and ensuring that goods are in stock when they are needed requires resourcefulness, good judgment, and self-confidence. Buyers must be able to make decisions quickly and to take risks. Marketing skills and the ability to identify products that will sell also are very important. Employers often look for leadership

ability, too, because buyers spend a large portion of their time supervising assistant buyers and dealing with manufacturers' representatives and store executives.

Experienced buyers may advance by moving to a department that manages a larger volume or by becoming a merchandise manager. Others may go to work in sales for a manufacturer or wholesaler.

An experienced purchasing agent or buyer may become an assistant purchasing manager in charge of a group of purchasing professionals before advancing to purchasing manager, supply manager, or director of materials management. At the top levels, duties may overlap with other management functions, such as production, planning, logistics, and marketing.

Regardless of industry, continuing education is essential for advancement. Many purchasers participate in seminars offered by professional societies and take college courses in supply management. Professional certification is becoming increasingly important, especially for those just entering the occupation.

In private industry, recognized marks of experience and professional competence are the Accredited Purchasing Practitioner (APP) and Certified Purchasing Manager (CPM) designations, conferred by the Institute for Supply Management, and the Certified Purchasing Professional (CPP) and Certified Professional Purchasing Manager (CPPM) designations, conferred by the American Purchasing Society. In Federal, State, and local government, the indications of professional competence are Certified Professional Public Buyer (CPPB) and Certified Public Purchasing Officer, (CPPO), conferred by the National Institute of Governmental Purchasing. Most of these certifications are awarded only after work-related experience and education requirements are met, and written or oral exams are successfully completed.

Job Outlook

Overall employment of purchasing managers, buyers, and purchasing agents is expected to grow slower than the average through the year 2012. Offsetting some declines for purchasing workers in the manufacturing sector will be increases in the services sector. Companies in the services sector, which have typically made purchases on an ad hoc basis, are beginning to realize that centralized purchasing offices may be more efficient. Demand for purchasing workers will be limited by improving software, which has eliminated much of the paperwork involved in ordering and procuring supplies, the increased use of credit cards by some employees to purchase supplies without using the services of the procurement or purchasing office, and the growing number of purchases being made electronically. Despite slower-than-average growth, some job openings will result from the need to replace workers who transfer to other occupations or leave the labor force.

The projected change in employment varies significantly by occupational specialty. Employment of purchasing managers is expected to grow more slowly than the average through 2012. The use of the Internet to conduct electronic commerce has made information easier to obtain, thus increasing the productivity of purchasing managers. The Internet also allows both large and small companies to bid on contracts. Exclusive supply contracts and long-term contracting have allowed companies to negotiate with fewer suppliers less frequently.

Employment of wholesale and retail buyers, except farm products, also is projected to grow more slowly than the average. In the retail industry, mergers and acquisitions have forced buying departments to consolidate. In addition, larger retail stores are removing their buying departments from regional markets and centralizing them at their headquarters.

In contrast, employment of purchasing agents, except wholesale, retail, and farm products, is expected to increase about as fast as the average for all occupations through 2012. Despite the greater use of electronic transactions, purchases of complex equipment are more difficult both to automate and to transact electronically. Employment of purchasing agents and buyers, farm products, also is projected to increase about as fast as the average for all occupations, as the need to evaluate the quality and freshness of farm products limits the ease of making purchases electronically.

Persons who have a bachelor's degree in business should have the best chance of obtaining a buyer position in wholesale or retail trade or within government. A bachelor's degree, combined with industry experience and knowledge of a technical field, will be an advantage for those interested in working for a manufacturing or industrial company. Government agencies and larger companies usually require a master's degree in business or public administration for top-level purchasing positions.

Earnings

Median annual earnings of purchasing managers were \$59,890 in 2002. The middle 50 percent earned between \$43,670 and \$81,950 a year. The lowest 10 percent earned less than \$32,330, and the highest 10 percent earned more than \$108,140 a year.

Median annual earnings for purchasing agents and buyers, farm products were \$40,900 in 2002. The middle 50 percent earned between \$31,390 and \$55,440 a year. The lowest 10 percent earned less than \$23,850, and the highest 10 percent earned more than \$76,740 a year.

Median annual earnings for wholesale and retail buyers, except farm products, were \$40,780 in 2002. The middle 50 percent earned between \$30,040 and \$55,670 a year. The lowest 10 percent earned less than \$23,270, and the highest 10 percent earned more than \$76,070 a year. Median annual earnings in the industries employing the largest numbers of wholesale and retail buyers, except farm products, in 2002 were as follows:

Management of companies and enterprises	\$49,150
Grocery and related product wholesalers	42,850
Machinery, equipment, and supplies merchant wholesalers	37,920
Building material and supplies dealers	35,910

Median annual earnings for purchasing agents, except wholesale, retail, and farm products, were \$45,090 in 2002. The middle 50 percent earned between \$34,820

and \$58,780 a year. The lowest 10 percent earned less than \$27,950, and the highest 10 percent earned more than \$73,990 a year. Median annual earnings in the industries employing the largest numbers of purchasing agents, except of wholesale, retail, and farm products, in 2002 were as follows:

Federal Government	\$58,410
Aerospace product and parts manufacturing	52,900
Management of companies and enterprises	50,790
Local government	42,450
General medical and surgical hospitals	34,420

Purchasing managers, buyers, and purchasing agents receive the same benefits package as other workers, including vacations, sick leave, life and health insurance, and pension plans. In addition to receiving standard benefits, retail buyers often earn cash bonuses based on their performance and may receive discounts on merchandise bought from their employer.

Sources of Additional Information

Further information about education, training, employment, and certification for purchasing careers is available from any of the following sources:

- American Purchasing Society, North Island Center, Suite 203, 8 East Galena Blvd., Aurora, IL 60506.
- Institute for Supply Management, P.O. Box 22160, Tempe, AZ 85285-2160. Internet: <http://www.ism.ws>
- National Institute of Governmental Purchasing, Inc., 151 Spring St., Suite 300, Herndon, VA 20170-5223. Internet: <http://www.nigp.org>

Significant Points

- Most employers prefer experienced individuals with a bachelor's degree in English, journalism or mass communications.
- Competition will be keen for jobs at large metropolitan and national newspapers, broadcast stations, and magazines; most entry-level openings arise at small broadcast stations and publications.
- Jobs often involve irregular hours, night and weekend work, and pressure to meet deadlines.
- Online publications and services are growing in number and sophistication, spurring the demand for writers and editors, especially those with Web experience.

Nature of the Work

Editors review, rewrite, and edit the work of writers. They may also do original writing. An editor's responsibilities vary with the employer and type and level of editorial position held. Editorial duties may include planning the content of books, technical journals, trade magazines, and other general-interest publications. Editors also decide what material will appeal to readers, review and edit drafts of books and articles, offer comments to improve the work, and suggest possible titles. In addition, they may oversee the production of the publications. In the book-publishing industry, an editor's primary responsibility is to review proposals for books and decide whether to buy the publication rights from the author.

Editors examine proposals and select material for publication or broadcast. They review and revise a writer's work for publication or dissemination. Most editors have at least a basic familiarity with technology, regularly using personal computers, desktop or electronic publishing systems, scanners, and other electronic communications equipment.

Major newspapers and newsmagazines usually employ several types of editors. The **executive editor** oversees **assistant editors** who have responsibility for particular subjects, such as local news, international news, feature stories, or sports. Executive editors generally have the final say about what stories are published and how they are covered. The **managing editor** usually is responsible for the daily operation of the news department. **Assignment editors** determine which reporters will cover a given story. **Copy editors** mostly review and edit a reporter's copy for accuracy, content, grammar, and style.

In smaller organizations, such as small daily or weekly newspapers or membership or publications departments of nonprofit or similar organizations, a single editor may do everything or share responsibility with only a few other people. Executive and managing editors typically hire writers, reporters, and other employees. They also plan budgets and negotiate contracts with freelance writers, sometimes called "stringers" in the news industry. In broadcasting companies, **program directors** have similar responsibilities.

Editors and program directors often have assistants, many of whom hold entry-level jobs. These assistants, such as copy editors and **production assistants**, review copy for errors in grammar, punctuation, and spelling and check the copy for readability, style, and agreement with editorial policy. They suggest revisions, such as changing words and rearranging sentences, to improve clarity or accuracy. They also carry out research for writers and verify facts, dates, and statistics. Production assistants arrange page layouts of articles, photographs, and advertising; compose headlines; and prepare copy for printing.

News analysts, reporters, and correspondents play a key role in our society. They gather information, prepare stories, and make broadcasts that inform us about local, State, national, and international events; present points of view on current issues; and report on the actions of public officials, corporate executives, special-interest groups, and others who exercise power.

News analysts examine, interpret, and broadcast news received from various sources. They also are called **newscasters or news anchors**. News anchors present news stories and introduce videotaped news or live transmissions from on-the-scene reporters.

In covering a story, reporters investigate leads and news tips, look at documents, observe events at the scene, and interview people. Reporters take notes and also may take photographs or shoot videos. At their office, they organize the material, determine the focus or emphasis, write their stories, and edit accompanying video material. Many reporters enter information or write stories on laptop computers, and electronically submit the material to their offices from remote locations. In some cases, **news writers** write a story from information collected and submitted by reporters. Radio and television reporters often compose stories and report "live" from the scene. At times, they later tape an introduction to or commentary on their story in the studio. Some journalists also interpret the news or offer opinions to readers, viewers, or listeners. In this role, they are called **commentators or columnists**.

General assignment reporters write about newsworthy occurrences, such as an accident, a political rally, the visit of a celebrity, or a company going out of business, as assigned. Large newspapers and radio and television stations assign reporters to gather news about specific topics or "beats," such as crime or education. Some reporters specialize in fields such as health, politics, foreign affairs, sports, theater, consumer affairs, social events, science, business, or religion. Investigative reporters cover stories that may take many days or weeks of information gathering. Some publications use teams of reporters instead of assigning specific beats, allowing reporters to cover a greater variety of stories. News teams may include reporters, editors, graphic artists, and photographers, working together to complete a story.

News correspondents report on news occurring in the large U.S. and foreign cities where they are stationed. Reporters on small publications cover all aspects of the news. They take photographs, write headlines, lay out pages, edit wire service stories, and write editorials. Some also solicit advertisements, sell subscriptions, and perform general office work.

Working Conditions

Some reporters and editors work in comfortable, private offices; others work in noisy rooms filled with the sound of keyboards and computer printers, as well as the voices of other writers tracking down information over the telephone. The search for information sometimes requires that the reporter travel to diverse workplaces, such as factories, offices, or laboratories, but many find their material through telephone interviews, the library, and the Internet.

The work of news analysts, reporters, and correspondents is usually hectic. They are under great pressure to meet deadlines. Broadcasts sometimes are made with little or no time for preparation. Some news analysts, reporters, and correspondents work in comfortable, private offices; others work in large rooms filled with the sound of keyboards and computer printers, as well as the voices of other reporters. Curious onlookers, police, or other emergency workers can distract those reporting from the scene for radio and television. Covering wars, political uprisings, fires, floods, and similar events is often dangerous.

Working hours vary. Reporters on morning papers often work from late afternoon until midnight. Radio and television reporters usually are assigned to a day or evening shift. Magazine reporters usually work during the day.

Reporters sometimes have to change their work hours to meet a deadline, or to follow late-breaking developments. Their work demands long hours, irregular schedules, and some travel. Many stations and networks are on the air 24 hours a day, so newscasters can expect to work unusual hours.

Employment

Editors held about 130,000 jobs in 2002. More than one-half of jobs for editors were salaried positions in the information sector, which includes newspaper, periodical, book, and directory publishers; radio and television broadcasting; software publishers; motion picture and sound recording industries; Internet service providers, web search portals, and data processing services; and Internet publishing and broadcasting. Substantial numbers also worked in advertising and related services, computer systems design and related services, and public and private educational services. Jobs with newspapers, business and professional journals, and technical and trade magazines are more widely dispersed throughout the country.

News analysts, reporters, and correspondents held about 66,000 jobs in 2002. About 60 percent worked for newspaper, periodical, book, and directory publishers. Another 25 percent worked in radio and television broadcasting. About 4,100 news analysts, reporters, and correspondents were self-employed.

Training, Other Qualifications, and Advancement

A college degree generally is required for a position as a reporter or editor. Although some employers look for a broad liberal arts background, most prefer to hire people with degrees in communications, journalism, or English. For those who specialize in a particular area, such as fashion, business, or legal issues, additional background in

the chosen field is expected. Knowledge of a second language is helpful for some positions.

Reporters and editors must be able to express ideas clearly and logically and should love to write. Creativity, curiosity, a broad range of knowledge, self-motivation, and perseverance also are valuable. Writers and editors must demonstrate good judgment and a strong sense of ethics in deciding what material to publish. Editors also need tact and the ability to guide and encourage others in their work.

For some jobs, the ability to concentrate amid confusion and to work under pressure is essential. Familiarity with electronic publishing, graphics, and video production equipment increasingly is needed. Online newspapers and magazines require knowledge of computer software used to combine online text with graphics, audio, video, and animation.

High school and college newspapers, literary magazines, community newspapers, and radio and television stations all provide valuable, but sometimes unpaid, practical writing experience. Many magazines, newspapers, and broadcast stations have internships for students. Interns write short pieces, conduct research and interviews, and learn about the publishing or broadcasting business.

In larger businesses, jobs usually are more formally structured. Beginners generally do research, fact checking, or copy editing. Advancement to full-scale writing or editing assignments may occur more slowly for newer writers and editors in larger organizations than for employees of smaller companies. Advancement often is more predictable, though, coming with the assignment of more important articles.

Most employers prefer individuals with a bachelor's degree in journalism or mass communications, but some hire graduates with other majors. They look for experience on school newspapers or broadcasting stations and internships with news organizations. Large-city newspapers and stations also may prefer candidates with a degree in a subject-matter specialty such as economics, political science, or business. Some large newspapers and broadcasters may hire only experienced reporters.

Bachelor's degree programs in journalism are available at more than 400 colleges or universities. About three-fourths of the courses in a typical curriculum are in liberal arts; the remaining courses are in journalism. Examples of journalism courses are introductory mass media, basic reporting and copy editing, history of journalism, and press law and ethics. Students planning a career in broadcasting take courses in radio and television news and production. Those planning newspaper or magazine careers usually specialize in news-editorial journalism. To create a story for an online presentation, they need to know how to use computer software to combine online story text with audio and video elements and graphics.

Many community and junior colleges offer journalism courses or programs; credits may be transferable to 4-year journalism programs. About 120 schools offered a master's degree in journalism in 2002; about 35 schools offered a Ph.D. degree. Some graduate programs are intended primarily as preparation for news careers, while others prepare journalism teachers, researchers and theorists, and advertising and public relations workers.

High school courses in English, journalism, and social studies provide a good foundation for college programs. Useful college liberal arts courses include English with an emphasis on writing, sociology, political science, economics, history, and psychology. Courses in computer science, business, and speech are useful as well. Fluency in a foreign language is necessary in some jobs.

Although reporters need good word processing skills, computer graphics and desktop publishing skills also are useful. Computer-assisted reporting involves the use of computers to analyze data in search of a story. This technique and the interpretation of the results require computer skills and familiarity with databases. Knowledge of news photography also is valuable for entry-level positions, which sometimes combine the responsibilities of a reporter with those of a camera operator or photographer.

Employers report that practical experience is the most important part of education and training. Upon graduation, many students have already gained much practical experience through part-time or summer jobs or through internships with news organizations. Most newspapers, magazines, and broadcast news organizations offer reporting and editing internships. Work on high school and college newspapers, at broadcasting stations, or on community papers or U.S. Armed Forces publications also provides practical training. In addition, journalism scholarships, fellowships, and assistantships awarded to college journalism students by universities, newspapers, foundations, and professional organizations are helpful. Experience as a stringer or freelancer—a part-time reporter who is paid only for stories printed—is advantageous.

Reporters should be dedicated to providing accurate and impartial news. Accuracy is important, both to serve the public and because untrue or libelous statements can lead to lawsuits. A nose for news, persistence, initiative, poise, resourcefulness, a good memory, and physical stamina are important, as is the emotional stability to deal with pressing deadlines, irregular hours, and dangerous assignments. Broadcast reporters and news analysts must be comfortable on camera. All reporters must be at ease in unfamiliar places and with a variety of people. Positions involving on-air work require a pleasant voice and appearance.

Most reporters start at small publications or broadcast stations as general assignment reporters or copy editors. Large publications and stations hire few recent graduates; as a rule, they require new reporters to have several years of experience.

Beginning reporters cover court proceedings and civic and club meetings, summarize speeches, and write obituaries. With experience, they report more difficult assignments, cover an assigned beat, or specialize in a particular field.

Some news analysts and reporters can advance by moving to larger newspapers or stations. A few experienced reporters become columnists, correspondents, writers, announcers, or public relations specialists. Others become editors in print journalism or program managers in broadcast journalism, who supervise reporters. Some eventually become broadcasting or publishing industry managers.

Job Outlook

Editors: Employment of editors is expected to grow about as fast as the average for all occupations through the year 2012. The outlook for most editing jobs is expected to be competitive, because many people with writing or journalism training are attracted to the occupation.

Employment of editors for newspapers, periodicals, book publishers, and nonprofit organizations is expected to increase as demand grows for these publications. Magazines and other periodicals increasingly are developing market niches, appealing to readers with special interests. Online publications and services are growing in number and sophistication, spurring the demand for editors, especially those with Web experience. Advertising and public-relations agencies, which also are growing, should be another source of new jobs.

Reporters: Employment of news analysts, reporters, and correspondents is expected to grow more slowly than the average for all occupations through the year 2012—the result of mergers, consolidations, and closures of newspapers; decreased circulation; increased expenses; and a decline in advertising profits. In addition to consolidation of local newspaper and television and radio station ownership, increasing competition for viewers from cable networks also should limit employment growth. Some job growth is expected in new media areas, such as online newspapers and magazines. Job openings also will result from the need to replace workers who leave their occupations permanently. Some news analysts, reporters, and correspondents find the work too stressful and hectic or do not like the lifestyle, and transfer to other occupations.

Most opportunities will be with small town and suburban newspapers and radio and television stations. Competition will continue to be keen for more sought-after jobs on large metropolitan and national newspapers, broadcast stations and networks, and magazines. Talented writers who can handle highly specialized scientific or technical subjects have an advantage. In addition, newspapers increasingly are hiring stringers and freelancers.

Journalism graduates have the background for work in closely related fields such as advertising and public relations, and many take jobs in these fields. Other graduates accept sales, managerial, or other nonmedia positions.

The number of job openings in the newspaper and broadcasting industries—in which news analysts, reporters, and correspondents are employed—is sensitive to economic ups and downs, because these industries depend on advertising revenue.

Earnings

Median annual earnings for salaried editors were \$41,170 in 2002. The middle 50 percent earned between \$30,770 and \$56,360. The lowest 10 percent earned less than \$24,010, and the highest 10 percent earned more than \$76,620. Median annual earnings in newspaper, periodical, book, and directory publishers were \$40,280.

Salaries for news analysts, reporters, and correspondents vary widely. Median annual earnings of news analysts, reporters, and correspondents were \$30,510 in

2002. The middle 50 percent earned between \$22,350 and \$47,170. The lowest 10 percent earned less than \$17,620, and the highest 10 percent earned more than \$69,450. Median annual earnings of news analysts, reporters, and correspondents were \$33,320 in radio and television broadcasting and \$29,090 in newspaper, periodical, book, and directory publishers in 2002.

Sources of Additional Information

For information on broadcasting education and scholarship resources, contact National Association of Broadcasters, 1771 N St. NW., Washington, DC 20036. Internet: <http://www.nab.org>

Information on careers in journalism, colleges and universities offering degree programs in journalism or communications, and journalism scholarships and internships may be obtained from Dow Jones Newspaper Fund, Inc., P.O. Box 300, Princeton, NJ 08543-0300.

Information on union wage rates for newspaper and magazine reporters is available from Newspaper Guild, Research and Information Department, 501 3rd St. NW., Suite 250, Washington, DC 20001.

For a list of schools with accredited programs in journalism and mass communications, send a stamped, self-addressed envelope to Accrediting Council on Education in Journalism and Mass Communications, University of Kansas School of Journalism and Mass Communications, Stauffer-Flint Hall, 1435 Jayhawk Blvd., Lawrence, KS 66045. Internet: <http://www.ku.edu/~acejmc/STUDENT/STUDENT.SHTML>

Names and locations of newspapers and a list of schools and departments of journalism are published in the *Editor and Publisher International Year Book*, available in most public libraries and newspaper offices.

Significant Points

- A master's degree in library science usually is required; special librarians often need an additional graduate or professional degree.
- A large number of retirements in the next decade is expected to result in many job openings for librarians to replace those who leave. Librarians increasingly use information technology to perform research, classify materials, and help students and library patrons seek information.

Nature of the Work

The traditional concept of a library is being redefined from a place to access paper records or books to one that also houses the most advanced media, including CD-ROM, the Internet, virtual libraries, and remote access to a wide range of resources. Consequently, librarians, or information professionals, increasingly are combining traditional duties with tasks involving quickly changing technology. Librarians assist people in finding information and using it effectively for personal and professional purposes. Librarians must have knowledge of a wide variety of scholarly and public information sources and must follow trends related to publishing, computers, and the media in order to oversee the selection and organization of library materials. Librarians manage staff and develop and direct information programs and systems for the public, to ensure that information is organized in a manner that meets users' needs.

Most librarian positions incorporate three aspects of library work: User services, technical services, and administrative services. Still, even librarians specializing in one of these areas have other responsibilities. Librarians in user services, such as reference and children's librarians, work with patrons to help them find the information they need. The job involves analyzing users' needs to determine what information is appropriate, as well as searching for, acquiring, and providing the information. The job also includes an instructional role, such as showing users how to access information. For example, librarians commonly help users navigate the Internet so they can search for relevant information efficiently. Librarians in technical services, such as acquisitions and cataloguing, acquire and prepare materials for use and often do not deal directly with the public. Librarians in administrative services oversee the management and planning of libraries: negotiate contracts for services, materials, and equipment; supervise library employees; perform public-relations and fundraising duties: prepare budgets; and direct activities to ensure that everything functions properly.

In small libraries or information centers, librarians usually handle all aspects of the work. They read book reviews, publishers' announcements, and catalogues to keep up with current literature and other available resources, and they select and purchase materials from publishers, wholesalers, and distributors. Librarians prepare new materials by classifying them by subject matter and describe books and other library materials to make them easy to find. Librarians supervise assistants, who prepare cards, computer records, or other access tools that direct users to resources. In large libraries, librarians often specialize in a single area, such as acquisitions,

cataloguing, bibliography, reference, special collections, or administration. Teamwork is increasingly important to ensure quality service to the public.

Librarians also compile lists of books, periodicals, articles, and audiovisual materials on particular subjects; analyze collections; and recommend materials. They collect and organize books, pamphlets, manuscripts, and other materials in a specific field, such as rare books, genealogy, or music. In addition, they coordinate programs such as storytelling for children and literacy skills and book talks for adults; conduct classes; publicize services; provide reference help; write grants; and oversee other administrative matters.

Librarians are classified according to the type of library in which they work: A public library; school library media center; college, university, or other academic library; or special library. Some librarians work with specific groups, such as children, young adults, adults, or the disadvantaged. In school library media centers, librarians—often called school media specialists—help teachers develop curricula, acquire materials for classroom instruction, and sometimes team teach.

Librarians also work in information centers or libraries maintained by government agencies, corporations, law firms, advertising agencies, museums, professional associations, medical centers, hospitals, religious organizations, and research laboratories. They acquire and arrange an organization's information resources, which usually are limited to subjects of special interest to the organization. These special librarians can provide vital information services by preparing abstracts and indexes of current periodicals, organizing bibliographies, or analyzing background information and preparing reports on areas of particular interest. For example, a special librarian working for a corporation could provide the sales department with information on competitors or new developments affecting the field. A medical librarian may provide information about new medical treatments, clinical trials, and standard procedures to health professionals, patients, consumers, and corporations. Government document librarians, who work for government agencies and depository libraries in each of the States, preserve government publications, records, and other documents that make up a historical record of government actions and decisionmaking.

Many libraries have access to remote databases and maintain their own computerized databases. The widespread use of automation in libraries makes database-searching skills important to librarians. Librarians develop and index databases and help train users to develop searching skills for the information they need. Some libraries are forming consortiums with other libraries through electronic mail. This practice allows patrons to submit information requests to several libraries simultaneously. The Internet also is expanding the amount of available reference information. Librarians must be aware of how to use these resources in order to locate information.

Librarians with computer and information systems skills can work as automated-systems librarians, planning and operating computer systems, and information architect librarians, designing information storage and retrieval systems and developing procedures for collecting, organizing, interpreting, and classifying information. These librarians analyze and plan for future information needs. The increasing use of automated information systems is enabling librarians to focus on administrative and budgeting responsibilities, grant writing, and specialized research

requests, while delegating more technical and user services responsibilities to technicians.

More and more, librarians are applying their information management and research skills to arenas outside of libraries—for example, database development, reference tool development, information systems, publishing, Internet coordination, marketing, web content management and design, and training of database users. Entrepreneurial librarians sometimes start their own consulting practices, acting as freelance librarians or information brokers and providing services to other libraries, businesses, or government agencies.

Working Conditions

Librarians spend a significant portion of time at their desks or in front of computer terminals; extended work at video display terminals can cause eyestrain and headaches. Assisting users in obtaining information or books for their jobs, homework, or recreational reading can be challenging and satisfying, but working with users under deadlines can be demanding and stressful. Some librarians lift and carry books, and some climb ladders to reach high stacks. Librarians in small organizations sometimes shelve books themselves.

More than 2 out of 10 librarians work part time. Public and college librarians often work weekends and evenings, as well as some holidays. School librarians usually have the same workday and vacation schedules as classroom teachers. Special librarians usually work normal business hours, but in fast-paced industries—such as advertising or legal services—they can work longer hours when needed.

Employment

Librarians held about 167,000 jobs in 2002. Most worked in school and academic libraries, but nearly a third worked in public libraries. The remainder worked in special libraries or as information professionals for companies and other organizations.

Training, Other Qualifications, and Advancement

A master's degree in library science (MLS) is necessary for librarian positions in most public, academic, and special libraries and in some school libraries. The Federal Government requires an MLS or the equivalent in education and experience. Many colleges and universities offer MLS programs, but employers often prefer graduates of the approximately 56 schools accredited by the American Library Association. Most MLS programs require a bachelor's degree; any liberal arts major is appropriate.

Most MLS programs take 1 year to complete; some take 2. A typical graduate program includes courses in the foundations of library and information science, including the history of books and printing, intellectual freedom and censorship, and the role of libraries and information in society. Other basic courses cover the selection and processing of materials, the organization of information, reference tools and strategies, and user services. Courses are adapted to educate librarians to use new resources brought about by advancing technology, such as online reference systems, Internet search methods, and automated circulation systems. Course

options can include resources for children or young adults; classification, cataloguing, indexing, and abstracting; library administration; and library automation. Computer-related course work is an increasingly important part of an MLS degree. Some programs offer interdisciplinary degrees combining technical courses in information science with traditional training in library science.

The MLS degree provides general preparation for library work, but some individuals specialize in a particular area, such as reference, technical services, or children's services. A Ph.D. degree in library and information science is advantageous for a college teaching position or for a top administrative job in a college or university library or large library system.

Usually, an MLS also is required of librarians working in special libraries. In addition, most special librarians supplement their education with knowledge of the subject in which they are specializing, sometimes earning a master's, doctoral, or professional degree in the subject. Areas of specialization include medicine, law, business, engineering, and the natural and social sciences. For example, a librarian working for a law firm may also be a licensed attorney, holding both library science and law degrees. In some jobs, knowledge of a foreign language is needed.

State certification requirements for public school librarians vary widely. Most States require school librarians, often called library media specialists, to be certified as teachers and to have had courses in library science. An MLS is needed in some cases, perhaps with a library media specialization, or a master's in education with a specialty in school library media or educational media. Some States require certification of public librarians employed in municipal, county, or regional library systems.

Librarians participate in continuing education and training once they are on the job, in order to keep abreast of new information systems brought about by changing technology.

Experienced librarians can advance to administrative positions, such as department head, library director, or chief information officer.

Job Outlook

Employment of librarians is expected to grow about as fast as the average for all occupations over the 2002–12 period. However, job opportunities are expected to be very good because a large number of librarians are expected to retire in the coming decade, creating many job openings. In addition, the number of people going into this profession has fallen in recent years, resulting in more jobs than applicants in some cases. Colleges and universities report the greatest difficulty in hiring librarians, because the pay is often less than the prospective employees can get elsewhere.

Offsetting the need for librarians are government budget cuts and the increasing use of computerized information storage and retrieval systems. Both will result in the hiring of fewer librarians and the replacement of librarians with less costly library technicians. Computerized systems make cataloguing easier, allowing library technicians to perform the work. In addition, many libraries are equipped for users to access library computers directly from their homes or offices. That way, users can

bypass librarians altogether and conduct research on their own. However, librarians will still be needed to manage staff, help users develop database-searching techniques, address complicated reference requests, and define users' needs.

Jobs for librarians outside traditional settings will grow the fastest over the decade. Nontraditional librarian jobs include working as information brokers and working for private corporations, nonprofit organizations, and consulting firms. Many companies are turning to librarians because of their research and organizational skills and their knowledge of computer databases and library automation systems. Librarians can review vast amounts of information and analyze, evaluate, and organize it according to a company's specific needs. Librarians also are hired by organizations to set up information on the Internet. Librarians working in these settings may be classified as systems analysts, database specialists and trainers, webmasters or web developers, or local area network (LAN) coordinators.

Earnings

Salaries of librarians vary according to the individual's qualifications and the type, size, and location of the library. Librarians with primarily administrative duties often have greater earnings. Median annual earnings of librarians in 2002 were \$43,090. The middle 50 percent earned between \$33,560 and \$54,250. The lowest 10 percent earned less than \$24,510, and the highest 10 percent earned more than \$66,590. Median annual earnings in the industries employing the largest numbers of librarians in 2002 were as follows:

Elementary and secondary schools	\$45,660
Colleges, universities, and professional schools	45,600
Local government	37,970
Other information services	37,770

The average annual salary for all librarians in the Federal Government in nonsupervisory, supervisory, and managerial positions was \$70,238 in 2003.

Nearly one in three librarians is a member of a union or is covered under a union contract.

Sources of Additional Information

For information on a career as a librarian and information on accredited library education programs and scholarships, contact American Library Association, Office for Human Resource Development and Recruitment, 50 East Huron St., Chicago, IL 60611. Internet: <http://www.ala.org>

For information on a career as a special librarian, write to Special Libraries Association, 1700 18th St. NW., Washington, DC 20009. Internet: <http://www.sla.org>

Information on graduate schools of library and information science can be obtained from Association for Library and Information Science Education, 1009 Commerce

Park Dr., Suite 150, PO Box 4219, Oak Ridge, TN 37839. Internet:
<http://www.alise.org>

For information on employment opportunities for health sciences librarians and for scholarship information, credentialing information, and a list of MLA-accredited schools offering programs in health sciences librarianship, contact Medical Library Association, 65 E Wacker Place , Suite 1900, Chicago, IL 60601. Internet:
<http://www.mlanet.org>

Information on acquiring a job as a librarian with the Federal Government may be obtained at <http://www.usajobs.opm.gov>.

State library agencies can furnish information on scholarships available through their offices, requirements for certification, and general information about career prospects in the particular State of interest. Several of these agencies maintain job hot lines reporting openings for librarians. State departments of education can furnish information on certification requirements and job opportunities for school librarians.

Insurance Underwriters

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Significant Points

- Because insurance is considered a necessity for people and businesses, there will always be a need for underwriters.
- Most large insurance companies prefer college graduates who have a degree in business administration or finance with courses in accounting; however, a bachelor's degree in any field—plus courses in business law and accounting—may be sufficient to qualify.

Nature of the Work

Insurance companies protect individuals and organizations from financial loss by assuming billions of dollars in risks each year. Underwriters are needed to identify and calculate the risk of loss from policyholders, establish appropriate premium rates, and write policies that cover these risks. An insurance company may lose business to competitors if the underwriter appraises risks too conservatively, or it may have to pay excessive claims if the underwriting actions are too liberal.

With the aid of computers, underwriters analyze information in insurance applications to determine if a risk is acceptable and will not result in a loss. Applications are often supplemented with reports from loss-control consultants, medical reports, data vendors, and actuarial studies. Underwriters then must decide whether to issue the policy and the appropriate premium to charge. In making this determination, underwriters serve as the main link between the insurance carrier and the insurance agent. On occasion, they accompany sales agents to make presentations to prospective clients.

Technology plays an important role in an underwriter's job. Underwriters use computer applications called "smart systems" to manage risks more efficiently and accurately. These systems automatically analyze and rate insurance applications, recommend acceptance or denial of the risk, and adjust the premium rate in accordance with the risk. With these systems, underwriters are better equipped to make sound decisions and avoid excessive losses.

The Internet also has affected the work of underwriters. Many insurance carriers' computer systems are now linked to different databases on the Internet that allow immediate access to information—such as driving records—necessary in determining a potential client's risk. This reduces the amount of time and paperwork necessary for an underwriter to complete a risk assessment.

Most underwriters specialize in one of three major categories of insurance—life, health, or property and casualty. Life and health insurance underwriters may further specialize in group or individual policies.

Property and casualty underwriters usually specialize in either commercial or personal insurance, and then by type of risk insured, such as fire, homeowners, automobile, marine, liability, or workers' compensation. In cases where casualty companies provide insurance through a single "package" policy, covering various types of risks, the underwriter must be familiar with different lines of insurance. For business insurance, the underwriter often must be able to evaluate the firm's entire operation in appraising its application for insurance.

An increasing proportion of insurance sales, particularly in life and health insurance, is being made through group contracts. A standard group policy insures everyone in a specified group through a single contract at a standard premium rate. The group underwriter analyzes the overall composition of the group to assure that the total risk is not excessive. Another type of group policy provides members of a group—a labor union, for example—with individual policies reflecting their needs. These usually are casualty policies, such as those covering automobiles. The casualty underwriter analyzes the application of each group member and makes individual appraisals. Some group underwriters meet with union or employer representatives to discuss the types of policies available to their group.

Working Conditions

Underwriters have desk jobs that require no unusual physical activity. Their offices usually are comfortable and pleasant. Although underwriters typically work a standard 40-hour week, more are working longer hours due to the downsizing of many insurance companies. Most underwriters are based in a home or regional branch office, but they occasionally attend meetings away from home for several days. Construction and marine underwriters frequently travel to inspect worksites and assess risks.

Employment

Insurance underwriters held about 102,000 jobs in 2002. The majority of underwriters—about 64 percent—work for insurance companies called "carriers." Most of the remaining underwriters work in insurance agencies or for organizations that offer insurance services to insurance companies and policyholders. A small

number of underwriters work in agencies owned and operated by banks, mortgage companies, and real estate firms.

Most underwriters are based in the insurance company's home office, but some, mostly in the property and casualty area, work out of regional branch offices of the insurance company. These underwriters usually have the authority to underwrite most risks and determine an appropriate rating without consulting the home office.

Training, Other Qualifications, and Advancement

For entry-level underwriting jobs, most large insurance companies prefer college graduates who have a degree in business administration or finance, with courses or experience in accounting. However, a bachelor's degree in almost any field—plus courses in business law and accounting—provides a good general background and may be sufficient to qualify. Because computers are an integral part of most underwriters' jobs, computer skills are essential.

New employees usually start as underwriter trainees or assistant underwriters. They may help collect information on applicants and evaluate routine applications under the supervision of an experienced risk analyst. Property and casualty trainees study claims files to become familiar with factors associated with certain types of losses. Many larger insurers offer work-study training programs, lasting from a few months to a year. As trainees gain experience, they are assigned policy applications that are more complex and cover greater risks. These require the use of computers for more efficient analysis and processing.

Underwriting can be a satisfying career for people who enjoy analyzing information and paying attention to detail. In addition, underwriters must possess good judgment in order to make sound decisions. Excellent communication and interpersonal skills also are essential, as much of the underwriter's work involves dealing with agents and other insurance professionals.

Continuing education is necessary for advancement. Insurance companies usually pay tuition for underwriting courses that their trainees successfully complete; some also offer salary incentives. Independent study programs for experienced property and casualty underwriters also are available. The Insurance Institute of America offers a program called "Introduction to Underwriting" for beginning underwriters, and the specialty designation, Associate in Commercial Underwriting (AU), the second formal step in developing a career in underwriting business insurance policies. Those interested in developing a career underwriting personal insurance policies may earn the Associate in Personal Insurance (API) designation. To earn either the AU or API designation, underwriters complete a series of courses and examinations that generally lasts 1 to 2 years.

The American Institute for Chartered Property Casualty Underwriters awards the designation Chartered Property and Casualty Underwriter, or CPCU, the third and final stage of development for an underwriter. Earning the more advanced CPCU designation takes about four years, and requires passing eight examinations covering risk management; insurance operations and regulations; business and insurance law; financial management; financial institutions; and a three course concentration in either personal or commercial insurance coverage. Although the CPCU may be mainly for underwriters, it is also meant for everyone working in all

aspects of property and casualty insurance. The American College offers the Chartered Life Underwriter (CLU) designation and the Registered Health Underwriter (RHU) designation for all life and health insurance professionals.

Experienced underwriters who complete courses of study may advance to senior underwriter or underwriting manager positions. Some underwriting managers are promoted to senior managerial jobs. Some employers require a master's degree to achieve this level. Other underwriters are attracted to the earnings potential of sales and therefore obtain State licenses to sell insurance and related financial products as agents or brokers.

Job Outlook

Employment of underwriters is expected to grow about as fast as the average for all occupations through 2012. Underwriting software will continue to make workers more productive; however, because computer software does not do away with the need for human skills, underwriter employment will increase as economic and population growth result in increased insurance needs by businesses and individuals. In addition, job openings will be generated to replace underwriters who transfer or leave the occupation.

Insurance carriers are always assessing new risks and offering policies to meet changing circumstances. Underwriters are particularly needed in the area of product development, where underwriters assess risks and set the premiums for new lines of insurance. One new line of insurance being offered by life insurance carriers that may provide job opportunities for underwriters is long term care insurance.

Demand for underwriters is also expected to improve as insurance carriers try to restore profitability to make up for an unusually large number of underwriting losses in recent years. As the carriers' returns on their investments have declined, insurers are placing more emphasis on underwriting to generate revenues. This renewed interest in underwriting will result in favorable job opportunities for underwriters in the near term.

Employment of underwriters has historically been relatively steady. Overall, the best prospects for underwriter jobs will be for persons with the right skills and credentials, such as excellent computer and communication skills coupled with a background in finance. Because insurance is considered a necessity for people and businesses, there will always be a need for underwriters. It is a profession that is less subject to recession and layoffs than other fields.

Earnings

Median annual earnings of insurance underwriters were \$45,590 in 2002. The middle 50 percent earned between \$35,190 and \$60,890 a year. The lowest 10 percent earned less than \$28,840, while the highest 10 percent earned over \$79,400. Median annual earnings in insurance carriers were \$46,690, while earnings in agencies, brokerages, and other insurance related activities were \$43,560.

Insurance companies usually provide better than average benefits, including employer-financed group life and health insurance, and retirement plans.

Sources of Additional Information

Information about a career as an insurance underwriter is available from the home offices of many life, health, and property-casualty insurance companies.

Information about the property-casualty insurance field can be obtained by contacting The Insurance Information Institute, 110 William St., New York, NY 10038. Internet: <http://www.iii.org>

Information on careers in the life insurance field can be obtained from LIMRA International, P.O. Box 203, Hartford, CT 06141.

Information on the underwriting function and the CPCU and AU designations can be obtained from The American Institute for Chartered Property and Casualty Underwriters/Insurance Institute of America, 720 Providence Rd., P.O. Box 3016, Malvern, PA 19355-0716. Internet: <http://www.aicpcu.org>

Information on the CLU and RHU designations can be obtained from The American College, 270 South Bryn Mawr Ave., Bryn Mawr, PA, 19010-2196. Internet: <http://www.amercoll.edu>

Architects

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Significant Points

- More than 1 in 5 architects was self-employed—about three times the proportion for all professional and related occupations.
- Licensing requirements include a professional degree in architecture, a period of practical training, and passing all divisions of the Architect Registration Examination.
- Architecture graduates may face competition, especially for jobs in the most prestigious firms; opportunities will be best for those with experience working for a firm while still in school and for those with knowledge of computer-aided design and drafting technology.

Nature of the Work

People need places in which to live, work, play, learn, worship, meet, govern, shop, and eat. These places may be private or public; indoors or outdoors; or rooms, buildings, or complexes; and together, they make up neighborhoods, towns, suburbs, and cities. **Architects**—licensed professionals trained in the art and science of building design—transform these needs into concepts and then develop the concepts into images and plans of buildings that can be constructed by others.

Architects design the overall aesthetic and look of buildings and other structures, but the design of a building involves far more than its appearance. Buildings also must be functional, safe, and economical and must suit the needs of the people who use

them. Architects consider all these factors when they design buildings and other structures.

Architects provide professional services to individuals and organizations planning a construction project. They may be involved in all phases of development, from the initial discussion with the client through the entire construction process. Their duties require specific skills—designing, engineering, managing, supervising, and communicating with clients and builders. Architects spend a great deal of time explaining their ideas to clients, construction contractors, and others. Successful architects must be able to communicate their unique vision persuasively.

The architect and client discuss the objectives, requirements, and budget of a project. In some cases, architects provide various predesign services—conducting feasibility and environmental impact studies, selecting a site, or specifying the requirements the design must meet. For example, they may determine space requirements by researching the numbers and types of potential users of a building. The architect then prepares drawings and a report presenting ideas for the client to review.

After discussing and agreeing on the initial proposal, architects develop final construction plans that show the building's appearance and details for its construction. Accompanying these plans are drawings of the structural system; air-conditioning, heating, and ventilating systems; electrical systems; communications systems; plumbing; and, possibly, site and landscape plans. The plans also specify the building materials and, in some cases, the interior furnishings. In developing designs, architects follow building codes, zoning laws, fire regulations, and other ordinances, such as those requiring easy access by disabled persons. Throughout the planning stage, they make necessary changes. Although they have traditionally used pencil and paper to produce design and construction drawings, architects are increasingly turning to computer-aided design and drafting (CADD) technology for these important tasks. Continual revision of plans based on client needs and budget constraints is often necessary.

Architects may also assist clients in obtaining construction bids, selecting contractors, and negotiating construction contracts. As construction proceeds, they may visit building sites to make sure that contractors follow the design, adhere to the schedule, use the specified materials, and meet work quality standards. The job is not complete until all construction is finished, required tests are conducted, and construction costs are paid. Sometimes, architects also provide post construction services, such as facilities management. They advise on energy efficiency measures, evaluate how well the building design adapts to the needs of occupants, and make necessary improvements.

Architects design a wide variety of buildings, such as office and apartment buildings, schools, churches, factories, hospitals, houses, and airport terminals. They also design complexes such as urban centers, college campuses, industrial parks, and entire communities. In addition, they may advise on the selection of building sites, prepare cost analysis and land-use studies, and do long-range planning for land development.

Architects sometimes specialize in one phase of work. Some specialize in the design of one type of building—for example, hospitals, schools, or housing. Others focus on

planning and predesign services or construction management and do minimal design work. They often work with engineers, urban planners, interior designers, landscape architects, and other professionals. In fact, architects spend a great deal of their time coordinating information from, and the work of, others engaged in the same project. Many architects—particularly at larger firms—use the Internet and e-mail to update designs and communicate changes efficiently. Architects also use the Internet to research product specifications and government regulations.

During the required training period leading up to licensing as architects, entry-level workers are called interns. This training period, which generally lasts 3 years, gives them practical work experience in preparation for the Architect Registration Examination (ARE). Typical duties may include preparing construction drawings on CADD, building models, or assisting in the design of one part of a project.

Working Conditions

Architects usually work in a comfortable environment. Most of their time is spent in offices consulting with clients, developing reports and drawings, and working with other architects and engineers. However, they often visit construction sites to review the progress of projects.

Architects may occasionally be under stress, working nights and weekends to meet deadlines. In 2002, more than half of all full-time architects worked more than 40 hours a week.

Employment

Architects held about 113,000 jobs in 2002. Almost 2 out of 3 jobs were in architectural, engineering, and related services—mostly in architectural firms with fewer than five workers. A small number worked for residential and nonresidential building construction firms and for government agencies responsible for housing, planning, or community development, such as the U.S. Departments of Defense and Interior, and the General Services Administration. About 1 in 5 architects was self-employed.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require individuals to be licensed (registered) before they may call themselves architects or contract to provide architectural services. Nevertheless, many architecture school graduates work in the field while they are in the process of becoming licensed. However, a licensed architect is required to take legal responsibility for all work. Licensing requirements include a professional degree in architecture, a period of practical training or internship, and passage of all divisions of the ARE.

In most States, the professional degree in architecture must be from one of the 113 schools of architecture that have degree programs accredited by the National Architectural Accrediting Board (NAAB). However, State architectural registration boards set their own standards, so graduation from a non-NAAB-accredited program may meet the educational requirement for licensing in a few States. Three types of professional degrees in architecture are available through colleges and universities.

The majority of all architectural degrees are from 5-year Bachelor of Architecture programs, intended for students entering university-level studies from high school or with no previous architectural training. In addition, a number of schools offer a 2-year Master of Architecture program for students with a preprofessional undergraduate degree in architecture or a related area, or a 3- or 4-year Master of Architecture program for students with a degree in another discipline.

The choice of degree depends upon each individual's preference and educational background. Prospective architecture students should consider the available options before committing to a program. For example, although the 5-year Bachelor of Architecture program offers the fastest route to the professional degree, courses are specialized, and if the student does not complete the program, transferring to a program offered by another discipline may be difficult. A typical program includes courses in architectural history and theory, building design, structures, technology, construction methods, professional practice, math, physical sciences, and liberal arts. Central to most architectural programs is the design studio, where students put into practice the skills and concepts learned in the classroom. During the final semester of many programs, students devote their studio time to creating an architectural project from beginning to end, culminating in a three-dimensional model of their design.

Many schools of architecture also offer postprofessional degrees for those who already have a bachelor's or master's degree in architecture or other areas. Although graduate education beyond the professional degree is not required for practicing architects, it may be for research, teaching, and certain specialties.

High school students interested in a career in architecture should take courses in English, history, art, social studies, mathematics, physics, and computer science. Students should also visit the design studio of a school of architecture or tour the offices of a local firm. In addition, many schools of architecture offer summer programs for high school students.

Architects must be able to communicate their ideas visually to their clients. Artistic and drawing ability is helpful, but not essential, to such communication. More important are a visual orientation and the ability to conceptualize and understand spatial relationships. Good communication skills, the ability to work independently or as part of a team, and creativity are important qualities for anyone interested in becoming an architect. Computer literacy also is required for writing specifications, for two- and three-dimensional drafting, and for financial management. Knowledge of CADD is helpful and will become essential as architectural firms continue to adopt that technology. Recently, the profession recognized National CAD Standards (NCS); architecture students who master NCS may have an advantage in the job market.

All State architectural registration boards require a training period before candidates may sit for the ARE and become licensed. Most States have adopted the training standards established by the Intern Development Program, a branch of the American Institute of Architects and the National Council of Architectural Registration Boards (NCARB). These standards stipulate broad and diversified training under the supervision of a licensed architect over a 3-year period. New graduates usually begin as interns in architectural firms, where they assist in preparing architectural documents or drawings. Some States allow some of the training to occur in the offices of related professionals, such as engineers or general contractors.

Architecture students who complete internships in architectural firms while still in school can count some of that time toward the required 3-year training period.

Interns may research building codes and materials or write specifications for building materials, installation criteria, the quality of finishes, and other, related details. After completing the on-the-job training period, interns are eligible to sit for the ARE. The examination tests candidates' knowledge, skills, and ability to provide the various services required in the design and construction of buildings. Nine critical areas are covered. Candidates who pass the ARE and meet all standards established by their State board are licensed to practice in that State.

Several States require continuing education to maintain a license, and many more States are expected to adopt mandatory continuing education. Requirements vary by State, but usually involve the completion of a certain number of credits every year or two through seminars, workshops, formal university classes, conferences, self-study courses, or other sources.

A growing number of architects voluntarily seek certification by the NCARB, which can facilitate an individual's becoming licensed to practice in additional States. Certification is awarded after independent verification of the candidate's educational transcripts, employment record, and professional references. Certification is the primary requirement for reciprocity of licensing among State Boards that are NCARB members.

After becoming licensed and gaining experience, architects take on increasingly responsible duties, eventually managing entire projects. In large firms, architects may advance to supervisory or managerial positions. Some architects become partners in established firms; others set up their own practices. Graduates with degrees in architecture also enter related fields, such as graphic, interior, or industrial design; urban planning; real estate development; civil engineering; and construction management.

Job Outlook

Prospective architects may face competition for entry-level positions, especially if the number of architectural degrees awarded remains at current levels or increases. Employment of architects is projected to grow about as fast as the average for all occupations through 2012, and additional job openings will stem from the need to replace architects who retire, transfer to new occupations, or leave the labor force permanently for other reasons. However, many individuals are attracted to this occupation, and the number of applicants often exceeds the number of available jobs, especially in the most prestigious firms. Prospective architects who gain career-related experience in an architectural firm while they are still in school and who know CADD technology—especially that which conforms to the new national standards—will have a distinct advantage in obtaining an intern position after graduation.

Employment of architects is strongly tied to the level of local construction, particularly nonresidential structures such as office buildings, shopping centers, schools, and healthcare facilities. Employment in nonresidential construction is expected to grow because the replacement and renovation of many industrial plants and buildings has been delayed for years and a large number of structures will have to be replaced or remodeled, particularly in urban areas where space for new

buildings is becoming limited. On the other hand, technology enhancements will dampen demand for new commercial construction as nontraditional work and retail environments, such as teleconferencing, home offices, telecommuting, and electronic shopping, proliferate.

Demographic trends and changes in healthcare delivery will influence the demand for certain institutional structures and should also provide more jobs for architects in the future. A growing and aging population will drive demand for the construction of adult daycare, assisted-living, and other outpatient facilities, all of which are preferable, less costly alternatives to hospitals and nursing homes. Similarly, the construction of schools will increase to accommodate growth in the school-aged population. Additions to existing schools (especially colleges and universities), as well as overall modernization, will continue to add to demand for architects through 2012.

Demand for residential construction is also expected to continue to grow. As the baby boomers reach their peak earning years and can afford to spend more on housing, demand for larger homes with more amenities, as well as for second homes, will continue to rise. Some older, more affluent, members of the baby-boom generation will want townhouses and condominiums in conveniently located suburban and urban settings. At the same time, as the "echo boomers" (the children of the baby boomers) start to augment the younger age groups, the demand for starter homes and rental apartments also should increase.

Growth in demand for new-home construction will be tempered by consumers' preference to perform home improvements and renovations—especially in attractive, established neighborhoods—rather than construct new homes. Many starter homes will be remodeled to appeal to more affluent, space- and amenity-hungry buyers. Also, as buyers trade up, some may prefer to remodel existing homes, rather than construct new homes.

Because construction—particularly office and retail construction—is sensitive to cyclical changes in the economy, architects will face especially strong competition for jobs or clients during recessions, and layoffs may ensue. Those involved in the design of institutional buildings, such as schools, hospitals, nursing homes, and correctional facilities, will be less affected by fluctuations in the economy.

Even in times of overall good job opportunities, however, there may be areas of the country with poor opportunities. Architects who are licensed to practice in one State must meet the licensing requirements of other States before practicing elsewhere. Obtaining licensure in other States, after initially receiving licensure in one State, is known as "reciprocity" and is much easier if an architect has received certification from the NCARB.

Earnings

Median annual earnings of wage and salary architects were \$56,620 in 2002. The middle 50 percent earned between \$44,030 and \$74,460. The lowest 10 percent earned less than \$36,280, and the highest 10 percent earned more than \$92,350.

Earnings of partners in established architectural firms may fluctuate because of changing business conditions. Some architects may have difficulty establishing their

own practices and may go through a period when their expenses are greater than their income, requiring substantial financial resources.

Sources of Additional Information

Information about education and careers in architecture can be obtained from:

- The American Institute of Architects, 1735 New York Ave. NW., Washington, DC 20006. Internet: <http://www.aia.org>
- Intern Development Program, National Council of Architectural Registration Boards, Suite 1100K, 1801 K Street NW., Washington, D.C. 20006-1310. Internet: <http://www.ncarb.org>

Computer Programmers

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Significant Points

- Nearly half of all computer programmers held a bachelor's degree in 2002; about 1 in 5 held a graduate degree.
- Employment is expected to grow much more slowly than that of other computer specialists.
- Prospects should be best for college graduates with knowledge of a variety of programming languages and tools; those with less formal education or its equivalent in work experience should face strong competition for programming jobs.

Nature of the Work

Computer programmers write, test, and maintain the detailed instructions, called programs, that computers must follow to perform their functions. They also conceive, design, and test logical structures for solving problems by computer. Many technical innovations in programming—advanced computing technologies and sophisticated new languages and programming tools—have redefined the role of a programmer and elevated much of the programming work done today. Job titles and descriptions may vary, depending on the organization. In this occupational statement, **computer programmer** refers to individuals whose main job function is programming; this group has a wide range of responsibilities and educational backgrounds.

Computer programs tell the computer what to do—which information to identify and access, how to process it, and what equipment to use. Programs vary widely depending upon the type of information to be accessed or generated. For example, the instructions involved in updating financial records are very different from those required to duplicate conditions on board an aircraft for pilots training in a flight simulator. Although simple programs can be written in a few hours, programs that use complex mathematical formulas, whose solutions can only be approximated, or that draw data from many existing systems may require more than a year of work. In most cases, several programmers work together as a team under a senior programmer's supervision.

Programmers write programs according to the specifications determined primarily by computer software engineers and systems analysts. After the design process is complete, it is the job of the programmer to convert that design into a logical series of instructions that the computer can follow. The programmer then codes these instructions in a conventional programming language, such as COBOL; an artificial intelligence language, such as Prolog; or one of the most advanced object-oriented languages such as Java, C++, or Smalltalk. Different programming languages are used depending on the purpose of the program. COBOL, for example, is commonly used for business applications, whereas Fortran (short for "formula translation") is used in science and engineering. C++ is widely used for both scientific and business applications. Many programmers at the enterprise level are also expected to know platform-specific languages used in database programming. Programmers generally know more than one programming language and, because many languages are similar, they often can learn new languages relatively easily. In practice, programmers often are referred to by the language they know, as are Java programmers, or the type of function they perform or environment in which they work, which is the case for database programmers, mainframe programmers, or Web programmers.

Many programmers update, repair, modify, and expand existing programs. When making changes to a section of code, called a *routine*, programmers need to make other users aware of the task that the routine is to perform. They do this by inserting comments in the coded instructions, so that others can understand the program. Many programmers use computer-assisted software engineering (CASE) tools to automate much of the coding process. These tools enable a programmer to concentrate on writing the unique parts of the program, because the tools automate various pieces of the program being built. CASE tools generate whole sections of code automatically, rather than line by line. Programmers also utilize libraries of pre-written code, which can then be modified or customized for a specific application. This also yields more reliable and consistent programs and increases programmers' productivity by eliminating some routine steps.

Programmers test a program by running it to ensure that the instructions are correct and that the program produces the desired outcome. If errors do occur, the programmer must make the appropriate change and recheck the program until it produces the correct results. This process is called testing and debugging. Programmers may continue to fix these problems throughout the life of a program. Programmers working in a mainframe environment, which involves a large centralized computer, may prepare instructions for a computer operator who will run the program. They also may contribute to a manual for persons who will be using the program.

Programmers often are grouped into two broad types—applications programmers and systems programmers. **Applications programmers** write programs to handle a specific job, such as a program to track inventory within an organization. They may also revise existing packaged software or customize generic applications called middleware. **Systems programmers**, on the other hand, write programs to maintain and control computer systems software, such as operating systems, networked systems, and database systems. These workers make changes in the sets of instructions that determine how the network, workstations, and central processing unit of the system handle the various jobs they have been given, and how they communicate with peripheral equipment such as terminals, printers, and disk drives.

Because of their knowledge of the entire computer system, systems programmers often help applications programmers to determine the source of problems that may occur with their programs.

Programmers in software development companies may work directly with experts from various fields to create software—either programs designed for specific clients or packaged software for general use—ranging from games and educational software to programs for desktop publishing and financial planning. Much of this type of programming takes place in the preparation of packaged software, which constitutes one of the most rapidly growing segments of the computer services industry.

In some organizations, particularly small ones, workers commonly known as **programmer-analysts** are responsible for both the systems analysis and the actual programming work. Advanced programming languages and new object-oriented programming capabilities are increasing the efficiency and productivity of both programmers and users. The transition from a mainframe environment to one that is based primarily on personal computers (PCs) has blurred the once rigid distinction between the programmer and the user. Increasingly, adept end-users are taking over many of the tasks previously performed by programmers. For example, the growing use of packaged software, such as spreadsheet and database management software packages, allows users to write simple programs to access data and perform calculations.

Working Conditions

Programmers generally work in offices in comfortable surroundings. Many programmers may work long hours or weekends to meet deadlines or fix critical problems that occur during off hours. Given the technology available, telecommuting is becoming common for a wide range of computer professionals, including computer programmers. As computer networks expand, more programmers are able to make corrections or fix problems remotely by using modems, e-mail, and the Internet to connect to a customer's computer.

Like other workers who spend long periods in front of a computer terminal typing at a keyboard, programmers are susceptible to eyestrain, back discomfort, and hand and wrist problems, such as carpal tunnel syndrome.

Employment

Computer programmers held about 499,000 jobs in 2002. Programmers are employed in almost every industry, but the largest concentrations are in computer systems design and related services and in software publishers, which includes firms that write and sell software. Large numbers of programmers also can be found in management of companies and enterprises, telecommunications companies, manufacturers of computer and electronic equipment, financial institutions, insurance carriers, educational institutions, and government agencies.

A large number of computer programmers are employed on a temporary or contract basis or work as independent consultants, as companies demand expertise with new programming languages or specialized areas of application. Rather than hiring programmers as permanent employees and then laying them off after a job is completed, employers can contract with temporary help agencies, consulting firms,

or directly with programmers themselves. A marketing firm, for example, may require the services of several programmers only to write and debug the software necessary to get a new customer resource management system running. This practice also enables companies to bring in people with a specific set of skills—usually in one of the latest technologies—as it applies to their business needs. Bringing in an independent contractor or consultant with a certain level of experience in a new or advanced programming language, for example, enables an establishment to complete a particular job without having to retrain existing workers. Such jobs may last anywhere from several weeks to a year or longer. There were 18,000 self-employed computer programmers in 2002.

Training, Other Qualifications, and Advancement

While there are many training paths available for programmers, mainly because employers' needs are so varied, the level of education and experience employers seek has been rising, due to the growing number of qualified applicants and the specialization involved with most programming tasks. Bachelor's degrees are commonly required, although some programmers may qualify for certain jobs with 2-year degrees or certificates. The associate degree is an increasingly attractive entry-level credential for prospective computer programmers. Most community colleges and many independent technical institutes and proprietary schools offer an associate degree in computer science or a related information technology field.

Employers are primarily interested in programming knowledge, and computer programmers can become certified in a programming language such as C++ or Java. College graduates who are interested in changing careers or developing an area of expertise also may return to a 2-year community college or technical school for additional training. In the absence of a degree, substantial specialized experience or expertise may be needed. Even when hiring programmers with a degree, employers appear to be placing more emphasis on previous experience.

Some computer programmers hold a college degree in computer science, mathematics, or information systems, whereas others have taken special courses in computer programming to supplement their degree in a field such as accounting, inventory control, or another area of business. As the level of education and training required by employers continues to rise, the proportion of programmers with a college degree should increase in the future. As indicated by the following tabulation, 65 percent of computer programmers had a bachelor's or higher degree in 2002.

	Percent
High school graduate or equivalent or less	7.7
Some college, no degree	15.2
Associate degree	11.6
Bachelor's degree	48.6
Graduate degree	16.7

Required skills vary from job to job, but the demand for various skills generally is driven by changes in technology. Employers using computers for scientific or engineering applications usually prefer college graduates who have degrees in computer or information science, mathematics, engineering, or the physical sciences.

Graduate degrees in related fields are required for some jobs. Employers who use computers for business applications prefer to hire people who have had college courses in management information systems (MIS) and business and who possess strong programming skills. Although knowledge of traditional languages still is important, employers are placing increasing emphasis on newer, object-oriented programming languages and tools, such as C++ and Java. Additionally, employers are seeking persons familiar with fourth- and fifth-generation languages that involve graphic user interface (GUI) and systems programming. Employers also prefer applicants who have general business skills and experience related to the operations of the firm. Students can improve their employment prospects by participating in a college work-study program or by undertaking an internship.

Most systems programmers hold a 4-year degree in computer science. Extensive knowledge of a variety of operating systems is essential for such workers. This includes being able to configure an operating system to work with different types of hardware and having the skills needed to adapt the operating system to best meet the needs of a particular organization. Systems programmers also must be able to work with database systems, such as DB2, Oracle, or Sybase.

When hiring programmers, employers look for people with the necessary programming skills who can think logically and pay close attention to detail. The job calls for patience, persistence, and the ability to work on exacting analytical work, especially under pressure. Ingenuity, creativity, and imagination also are particularly important when programmers design solutions and test their work for potential failures. The ability to work with abstract concepts and to do technical analysis is especially important for systems programmers, because they work with the software that controls the computer's operation. Because programmers are expected to work in teams and interact directly with users, employers want programmers who are able to communicate with nontechnical personnel.

Entry-level or junior programmers may work alone on simple assignments after some initial instruction, or they may be assigned to work on a team with more experienced programmers. Either way, beginning programmers generally must work under close supervision. Because technology changes so rapidly, programmers must continuously update their knowledge and skills by taking courses sponsored by their employer or by software vendors, or offered through local community colleges and universities.

For skilled workers who keep up to date with the latest technology, the prospects for advancement are good. In large organizations, programmers may be promoted to lead programmer and be given supervisory responsibilities. Some applications programmers may move into systems programming after they gain experience and take courses in systems software. With general business experience, programmers may become programmer-analysts or systems analysts or be promoted to a managerial position. Other programmers, with specialized knowledge and experience with a language or operating system, may work in research and development on multimedia or Internet technology, for example. As employers increasingly contract out programming jobs, more opportunities should arise for experienced programmers with expertise in a specific area to work as consultants.

Certification is a way to demonstrate a level of competence, and may provide a jobseeker with a competitive advantage. In addition to language-specific certificates

that a programmer can obtain, product vendors or software firms also offer certification and may require professionals who work with their products to be certified. Voluntary certification also is available through other various organizations.

Job Outlook

Employment of programmers is expected to grow about as fast as the average for all occupations through 2012. Jobs for both systems and applications programmers should be most plentiful in data processing service firms, software houses, and computer consulting businesses. These types of establishments are part of computer systems design and related services and software publishers, which are projected to be among the fastest growing industries in the economy over the 2002-12 period. As organizations attempt to control costs and keep up with changing technology, they will need programmers to assist in conversions to new computer languages and systems. In addition, numerous job openings will result from the need to replace programmers who leave the labor force or transfer to other occupations such as manager or systems analyst.

Employment of programmers, however, is expected to grow much more slowly than that of other computer specialists. With the rapid gains in technology, sophisticated computer software now has the capability to write basic code, eliminating the need for more programmers to do this routine work. The consolidation and centralization of systems and applications, developments in packaged software, advances in programming languages and tools, and the growing ability of users to design, write, and implement more of their own programs means that more of the programming functions can be transferred from programmers to other types of workers. Furthermore, as the level of technological innovation and sophistication increases, programmers are likely to face increasing competition from programming businesses overseas, to which much routine work can be contracted out at a lower cost.

Nevertheless, employers will continue to need programmers who have strong technical skills and who understand an employer's business and its programming requirements. This means that programmers will have to keep abreast of changing programming languages and techniques. Given the importance of networking and the expansion of client/server, Web-based, and wireless environments, organizations will look for programmers who can support data communications and help to implement electronic commerce and Intranet strategies. Demand for programmers with strong object-oriented programming capabilities and technical specialization in areas such as client/server programming, wireless applications, multimedia technology, and graphic user interface (GUI) should arise from the expansion of intranets, extranets, and Internet applications. Programmers also will be needed to create and maintain expert systems and embed these technologies in more products. Finally, growing emphasis on cyber-security will lead to increased demand for programmers who are familiar with digital security issues and skilled in using appropriate security technology.

As programming tasks become increasingly sophisticated and additional levels of skill and experience are demanded by employers, graduates of 2-year programs and people with less than a 2-year degree or its equivalent in work experience should face strong competition for programming jobs. Competition for entry-level positions, however, also can affect applicants with a bachelor's degree. Prospects should be best for college graduates with knowledge of, and experience working with, a variety

of programming languages and tools—including C++ and other object-oriented languages such as Java, as well as newer, domain-specific languages that apply to computer networking, database management, and Internet application development. Obtaining vendor-specific or language-specific certification also can provide a competitive edge. Because demand fluctuates with employers' needs, jobseekers should keep up to date with the latest skills and technologies. Individuals who want to become programmers can enhance their prospects by combining the appropriate formal training with practical work experience.

Earnings

Median annual earnings of computer programmers were \$60,290 in 2002. The middle 50 percent earned between \$45,960 and \$78,140 a year. The lowest 10 percent earned less than \$35,080; the highest 10 percent earned more than \$96,860. Median annual earnings in the industries employing the largest numbers of computer programmers in 2002 were:

Professional and commercial equipment and supplies merchant wholesalers	\$70,440
Software publishers	66,870
Computer systems design and related services	65,640
Management of companies and enterprises	59,850
Data processing, hosting, and related services	59,300

According to the National Association of Colleges and Employers, starting salary offers for graduates with a bachelor's degree in computer programming averaged \$45,558 a year in 2003.

According to Robert Half International, a firm providing specialized staffing services, average annual starting salaries in 2003 ranged from \$51,500 to \$80,500 for applications development programmers/analysts, and from \$55,000 to \$87,750 for software developers. Average starting salaries for mainframe systems programmers ranged from \$53,250 to \$68,750 in 2003.

Sources of Additional Information

State employment service offices can provide information about job openings for computer programmers. Municipal chambers of commerce are an additional source of information on an area's largest employers.

Further information about computer careers is available from:

- Association for Computing Machinery (ACM), 1515 Broadway, New York, NY 10036. Internet: <http://www.acm.org>
- Institute of Electrical and Electronics Engineers Computer Society, Headquarters Office, 1730 Massachusetts Ave. NW., Washington, DC 20036-1992. Internet: <http://www.computer.org>
- National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: <http://www.nwcet.org>

Significant Points

- Employment is projected to increase faster than the average, as rapid growth in the number of middle-aged and elderly individuals increases the demand for therapeutic services.
- A bachelor's degree in occupational therapy is the minimum educational requirement; beginning in 2007, however, a master's degree or higher will be required.
- Occupational therapists are increasingly taking on supervisory roles.
- More than a quarter of occupational therapists work part time.

Nature of the Work

Occupational therapists (OTs) help people improve their ability to perform tasks in their daily living and working environments. They work with individuals who have conditions that are mentally, physically, developmentally, or emotionally disabling. They also help them to develop, recover, or maintain daily living and work skills. Occupational therapists help clients not only to improve their basic motor functions and reasoning abilities, but also to compensate for permanent loss of function. Their goal is to help clients have independent, productive, and satisfying lives.

Occupational therapists assist clients in performing activities of all types, ranging from using a computer to caring for daily needs such as dressing, cooking, and eating. Physical exercises may be used to increase strength and dexterity, while other activities may be chosen to improve visual acuity and the ability to discern patterns. For example, a client with short-term memory loss might be encouraged to make lists to aid recall, and a person with coordination problems might be assigned exercises to improve hand-eye coordination. Occupational therapists also use computer programs to help clients improve decision-making, abstract-reasoning, problem-solving, and perceptual skills, as well as memory, sequencing, and coordination—all of which are important for independent living.

Therapists instruct those with permanent disabilities, such as spinal cord injuries, cerebral palsy, or muscular dystrophy, in the use of adaptive equipment, including wheelchairs, splints, and aids for eating and dressing. They also design or make special equipment needed at home or at work. Therapists develop computer-aided adaptive equipment and teach clients with severe limitations how to use that equipment in order to communicate better and control various aspects of their environment.

Some occupational therapists treat individuals whose ability to function in a work environment has been impaired. These practitioners arrange employment, evaluate the work environment, plan work activities, and assess the client's progress. Therapists also may collaborate with the client and the employer to modify the work environment so that the work can be successfully completed.

Occupational therapists may work exclusively with individuals in a particular age group or with particular disabilities. In schools, for example, they evaluate children's

abilities, recommend and provide therapy, modify classroom equipment, and help children participate as fully as possible in school programs and activities. Occupational therapy also is beneficial to the elderly population. Therapists help the elderly lead more productive, active, and independent lives through a variety of methods, including the use of adaptive equipment.

Occupational therapists in mental-health settings treat individuals who are mentally ill, mentally retarded, or emotionally disturbed. To treat these problems, therapists choose activities that help people learn to engage in and cope with daily life. Activities include time management skills, budgeting, shopping, homemaking, and the use of public transportation. Occupational therapists also may work with individuals who are dealing with alcoholism, drug abuse, depression, eating disorders, or stress-related disorders.

Assessing and recording a client's activities and progress is an important part of an occupational therapist's job. Accurate records are essential for evaluating clients, for billing, and for reporting to physicians and other healthcare providers.

Working Conditions

Occupational therapists in hospitals and other healthcare and community settings usually worked a 40-hour week. Those in schools may participate in meetings and other activities during and after the school day. In 2002, more than a quarter of occupational therapists worked part time.

In large rehabilitation centers, therapists may work in spacious rooms equipped with machines, tools, and other devices generating noise. The work can be tiring, because therapists are on their feet much of the time. Those providing home healthcare services may spend time driving from appointment to appointment. Therapists also face hazards such as back strain from lifting and moving clients and equipment.

Therapists increasingly are taking on supervisory roles. Due to rising healthcare costs, third-party payers are beginning to encourage occupational therapist assistants and aides to take more hands-on responsibility. By having assistants and aides work more closely with clients under the guidance of a therapist, the cost of therapy should decline.

Employment

Occupational therapists held about 82,000 jobs in 2002. About 1 in 10 occupational therapists held more than one job. The largest number of jobs was in hospitals. Other major employers were offices of other health practitioners (which includes offices of occupational therapists), public and private educational services, and nursing care facilities. Some occupational therapists were employed by home healthcare services, outpatient care centers, offices of physicians, individual and family services, community care facilities for the elderly, and government agencies.

A small number of occupational therapists were self-employed in private practice. These practitioners saw clients referred by physicians or other health professionals or provided contract or consulting services to nursing care facilities, schools, adult daycare programs, and home healthcare agencies.

Training, Other Qualifications, and Advancement

Currently, a bachelor's degree in occupational therapy is the minimum requirement for entry into this field. Beginning in 2007, however, a master's degree or higher will be the minimum educational requirement. As a result, students in bachelor's-level programs should complete their coursework and fieldwork before 2007. All States, Puerto Rico, and the District of Columbia regulate the practice of occupational therapy. To obtain a license, applicants must graduate from an accredited educational program and pass a national certification examination. Those who pass the exam are awarded the title "Occupational Therapist Registered (OTR)."

In 2003, entry-level education was offered in 38 bachelor's degree programs, 3 post baccalaureate certificate programs for students with a degree other than occupational therapy, and 86 entry-level master's degree programs. There were 48 programs that offered a combined bachelor's and master's degree and five offered an entry-level doctoral degree. Most schools have full-time programs, although a growing number also offer weekend or part-time programs.

Occupational therapy coursework includes physical, biological, and behavioral sciences and the application of occupational therapy theory and skills. Completion of 6 months of supervised fieldwork also is required.

Persons considering this profession should take high school courses in biology, chemistry, physics, health, art, and the social sciences. College admissions offices also look favorably at paid or volunteer experience in the healthcare field.

Occupational therapists need patience and strong interpersonal skills to inspire trust and respect in their clients. Ingenuity and imagination in adapting activities to individual needs are assets. Those working in home healthcare services must be able to adapt to a variety of settings.

Job Outlook

Employment of occupational therapists is expected to increase faster than the average for all occupations through 2012. The impact of proposed Federal legislation imposing limits on reimbursement for therapy services may adversely affect the job market for occupational therapists in the near term. However, over the long run, the demand for occupational therapists should continue to rise as a result of growth in the number of individuals with disabilities or limited function who require therapy services. The baby-boom generation's movement into middle age, a period when the incidence of heart attack and stroke increases, will spur the demand for therapeutic services. Growth in the population 75 years and older—an age group that suffers from high incidences of disabling conditions—also will increase the demand for therapeutic services. In addition, medical advances now enable more patients with critical problems to survive—patients who ultimately may need extensive therapy.

Hospitals will continue to employ a large number of occupational therapists to provide therapy services to acutely ill inpatients. Hospitals also will need occupational therapists to staff their outpatient rehabilitation programs.

Employment growth in schools will result from the expansion of the school-age population and extended services for disabled students. Therapists will be needed to help children with disabilities prepare to enter special education programs.

Earnings

Median annual earnings of occupational therapists were \$51,990 in 2002. The middle 50 percent earned between \$42,910 and \$ 61,620. The lowest 10 percent earned less than \$35,130, and the highest 10 percent earned more than \$74,390. Median annual earnings in the industries employing the largest numbers of occupational therapists in 2002 were as follows:

Offices of other health practitioners	\$53,660
Nursing care facilities	53,930
General medical and surgical hospitals	53,210
Elementary and secondary schools	45,740

Sources of Additional Information

For more information on occupational therapy as a career, contact American Occupational Therapy Association, 4720 Montgomery Lane, Bethesda, MD 20824-1220. Internet: <http://www.aota.org>

Accountants and Auditors

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Significant Points

- Most jobs require at least a bachelor's degree in accounting or a related field.
- Overall job opportunities should be favorable, although jobseekers who obtain professional recognition through certification or licensure, a master's degree, proficiency in accounting and auditing computer software, or specialized expertise will have an advantage.
- An increase in the number of businesses, changing financial laws and regulations, and increased scrutiny of company finances will drive growth of accountants and auditors.

Nature of the Work

Accountants and auditors help to ensure that the Nation's firms are run efficiently, its public records kept accurately, and its taxes paid properly and on time. They perform these vital functions by offering an increasingly wide array of business and accounting services to their clients. These services include public, management, and government accounting, as well as internal auditing. Beyond the fundamental tasks of the occupation—preparing, analyzing, and verifying financial documents in order to provide information to clients—many accountants now are required to possess a wide range of knowledge and skills. Accountants and auditors are broadening the services they offer to include budget analysis, financial and investment planning, information technology consulting, and limited legal services.

Specific job duties vary widely among the four major fields of accounting: **public, management, government, and internal.**

Public accountants perform a broad range of accounting, auditing, tax, and consulting activities for their clients, who may be corporations, governments, nonprofit organizations, or individuals. For example, some public accountants concentrate on tax matters, such as advising companies of the tax advantages and disadvantages of certain business decisions and preparing individual income tax returns. Others offer advice in areas such as compensation or employee healthcare benefits, the design of accounting and data-processing systems, and the selection of controls to safeguard assets. Still others audit clients' financial statements and report to investors and authorities that the statements have been correctly prepared and reported. Public accountants, many of whom are Certified Public Accountants (CPAs), generally have their own businesses or work for public accounting firms.

Some public accountants specialize in forensic accounting—investigating and interpreting white collar crimes such as securities fraud and embezzlement, bankruptcies and contract disputes, and other complex and possibly criminal financial transactions, such as money laundering by organized criminals. Forensic accountants combine their knowledge of accounting and finance with law and investigative techniques in order to determine if illegal activity is going on. Many forensic accountants work closely with law enforcement personnel and lawyers during investigations and often appear as expert witnesses during trials.

In response to the recent accounting scandals, new Federal legislation restricts the nonauditing services that public accountants can provide to clients. If an accounting firm audits a client's financial statements, that same firm cannot provide advice in the areas of human resources, technology, investment banking, or legal matters, although accountants may still advise on tax issues, such as establishing a tax shelter. Accountants may still advise other clients in these areas, or may provide advice within their own firm.

Management accountants—also called cost, managerial, industrial, corporate, or private accountants—record and analyze the financial information of the companies for which they work. Other responsibilities include budgeting, performance evaluation, cost management, and asset management. Usually, management accountants are part of executive teams involved in strategic planning or new-product development. They analyze and interpret the financial information that corporate executives need to make sound business decisions. They also prepare financial reports for nonmanagement groups, including stockholders, creditors, regulatory agencies, and tax authorities. Within accounting departments, they may work in various areas, including financial analysis, planning and budgeting, and cost accounting.

Government accountants and auditors work in the public sector, maintaining and examining the records of government agencies and auditing private businesses and individuals whose activities are subject to government regulations or taxation. Accountants employed by Federal, State, and local governments guarantee that revenues are received and expenditures are made in accordance with laws and regulations. Those who are employed by the Federal Government may work as Internal Revenue Service agents or in financial management, financial institution examination, or budget analysis and administration.

Internal auditors verify the accuracy of their organization's internal records and check for mismanagement, waste, or fraud. Internal auditing is an increasingly important area of accounting and auditing. Internal auditors examine and evaluate their firms' financial and information systems, management procedures, and internal controls to ensure that records are accurate and controls are adequate to protect against fraud and waste. They also review company operations—evaluating their efficiency, effectiveness, and compliance with corporate policies and procedures, laws, and government regulations. There are many types of highly specialized auditors, such as electronic data-processing, environmental, engineering, legal, insurance premium, bank, and healthcare auditors. As computer systems make information timelier, internal auditors help managers to base their decisions on actual data, rather than personal observation. Internal auditors also may recommend controls for their organization's computer system to ensure the reliability of the system and the integrity of the data.

Computers are rapidly changing the nature of the work for most accountants and auditors. With the aid of special software packages, accountants summarize transactions in standard formats for financial records and organize data in special formats for financial analysis. These accounting packages greatly reduce the amount of tedious manual work associated with data management and recordkeeping. Computers enable accountants and auditors to be more mobile and to use their clients' computer systems to extract information from databases and the Internet. As a result, a growing number of accountants and auditors with extensive computer skills specialize in correcting problems with software or in developing software to meet unique data management and analytical needs. Accountants also are beginning to perform more technical duties, such as implementing, controlling, and auditing systems and networks, and developing technology plans and budgets.

Increasingly, accountants also are assuming the role of a personal financial advisor. They not only provide clients with accounting and tax help, but also help them develop personal budgets, manage assets and investments, plan for retirement, and recognize and reduce exposure to risks. This role is a response to client demands for a single trustworthy individual or firm to meet all of their financial needs. However, accountants are restricted from providing these services to clients whose financial statements they also prepare.

Working Conditions

Most accountants and auditors work in a typical office setting. Self-employed accountants may be able to do part of their work at home. Accountants and auditors employed by public accounting firms and government agencies may travel frequently to perform audits at branches of their firm, clients' places of business, or government facilities.

Most accountants and auditors generally work a standard 40-hour week, but many work longer hours, particularly if they are self-employed and have numerous clients. Tax specialists often work long hours during the tax season.

Employment

Accountants and auditors held about 1.1 million jobs in 2002. They worked throughout private industry and government, but 1 out of 5 wage and salary

accountants worked for accounting, tax preparation, bookkeeping, and payroll services firms. Approximately 1 out of 10 accountants or auditors were self-employed.

Many accountants and auditors are unlicensed management accountants, internal auditors, or government accountants and auditors; however, a large number are licensed Certified Public Accountants. Most accountants and auditors work in urban areas, where public accounting firms and central or regional offices of businesses are concentrated.

Some individuals with backgrounds in accounting and auditing are full-time college and university faculty; others teach part time while working as self-employed accountants or employed as accountants for private industry or government.

Training, Other Qualifications, and Advancement

Most accountant and auditor positions require at least a bachelor's degree in accounting or a related field. Beginning accounting and auditing positions in the Federal Government, for example, usually require 4 years of college (including 24 semester hours in accounting or auditing) or an equivalent combination of education and experience. Some employers prefer applicants with a master's degree in accounting, or with a master's degree in business administration with a concentration in accounting.

Previous experience in accounting or auditing can help an applicant get a job. Many colleges offer students an opportunity to gain experience through summer or part-time internship programs conducted by public accounting or business firms. In addition, practical knowledge of computers and their applications in accounting and internal auditing is a great asset for jobseekers in the accounting field.

Professional recognition through certification or licensure provides a distinct advantage in the job market. CPAs are licensed by a State Board of Accountancy. The vast majority of States require CPA candidates to be college graduates, but a few States substitute a number of years of public accounting experience for a college degree. As of early 2003, based on recommendations made by the American Institute of Certified Public Accountants (AICPA), 42 States and the District of Columbia required CPA candidates to complete 150 semester hours of college coursework—an additional 30 hours beyond the usual 4-year bachelor's degree. Another five States—Arizona, Minnesota, New Mexico, New York, and Virginia—have adopted similar legislation that will become effective between 2004 and 2009. Colorado, Delaware, New Hampshire, and Vermont are the only States that do not require 150 semester hours. Many schools have altered their curricula accordingly with most programs offering masters degrees as part of the 150 hours, and prospective accounting majors should carefully research accounting curricula and the requirements of any States in which they hope to become licensed.

All States use the four-part Uniform CPA Examination prepared by the AICPA. The 2-day CPA examination is rigorous, and only about one-quarter of those who take it each year passes every part they attempt. Candidates are not required to pass all four parts at once, but most States require candidates to pass at least two parts for partial credit and to complete all four sections within a certain period. Most States also require applicants for a CPA certificate to have some accounting experience. In

May 2004, the CPA exam will become computerized and offered quarterly at various testing centers throughout the United States.

The AICPA also offers members with valid CPA certificates the option to receive the Accredited in Business Valuation (ABV), Certified Information Technology Professional (CITP), or Personal Financial Specialist (PFS) designations. The addition of these designations to the CPA distinguishes those accountants with a certain level of expertise in the nontraditional areas in which accountants are practicing more frequently. The ABV designation requires a written exam, as well as completion of a minimum of 10 business valuation projects that demonstrate a candidate's experience and competence. The CITP requires payment of a fee, a written statement of intent, and the achievement of a set number of points awarded for business experience and education. Those who do not meet the required number of points may substitute a written exam. Candidates for the PFS designation also must achieve a certain level of points, based on experience and education, and must pass a written exam and submit references.

Nearly all States require CPAs and other public accountants to complete a certain number of hours of continuing professional education before their licenses can be renewed. The professional associations representing accountants sponsor numerous courses, seminars, group study programs, and other forms of continuing education.

Accountants and auditors also can seek to obtain other forms of credentials from professional societies on a voluntary basis. Voluntary certification can attest to professional competence in a specialized field of accounting and auditing. It also can certify that a recognized level of professional competence has been achieved by accountants and auditors who have acquired some skills on the job, without the formal education or public accounting work experience needed to meet the rigorous standards required to take the CPA examination.

The Institute of Management Accountants (IMA) confers the Certified Management Accountant (CMA) designation upon applicants who complete a bachelor's degree or attain a minimum score on specified graduate school entrance exams. Applicants, who must have worked at least 2 years in management accounting, also must pass a four-part examination, agree to meet continuing education requirements, and comply with standards of professional conduct. The CMA program is administered by the Institute of Certified Management Accountants, an affiliate of the IMA.

Graduates from accredited colleges and universities who have worked for 2 years as internal auditors and have passed a four-part examination may earn the Certified Internal Auditor (CIA) designation from the Institute of Internal Auditors (IIA). The IIA recently implemented three new specialty designations—Certification in Control Self-Assessment (CCSA), Certified Government Auditing Professional (CGAP), and Certified Financial Services Auditor (CFSA). Requirements are similar to those of the CIA. The Information Systems Audit and Control Association confers the Certified Information Systems Auditor (CISA) designation upon candidates who pass an examination and have 5 years of experience in auditing information systems. Auditing or data-processing experience and a college education may be substituted for up to 2 years of work experience in this program. For instance, an internal auditor might be a CPA, CIA, and CISA.

The Accreditation Council for Accountancy and Taxation, a satellite organization of the National Society of Public Accountants, confers three designations—Accredited Business Accountant (ABA), Accredited Tax Advisor (ATA), and Accredited Tax Preparer (ATP)—on accountants specializing in tax preparation for small- and medium-sized businesses. Candidates for the ABA must pass an exam, while candidates for the ATA and ATP must complete the required coursework and pass an exam. Often, a practitioner will hold multiple licenses and designations.

The Association of Government Accountants grants the Certified Government Financial Manager (CGFM) designation for accountants, auditors, and other government financial personnel at the Federal, State, and local levels. Candidates must have a minimum of a bachelor's degree, 24 hours of study in financial management, and 2 years' experience in government, and must pass a series of three exams. The exams cover topics in governmental environment; governmental accounting, financial reporting, and budgeting; and financial management and control.

Persons planning a career in accounting should have an aptitude for mathematics and be able to analyze, compare, and interpret facts and figures quickly. They must be able to clearly communicate both written and verbally the results of their work to clients and managers. Accountants and auditors must be good at working with people, as well as with business systems and computers. At a minimum, accountants should be familiar with basic accounting software packages. Because financial decisions are made based on their statements and services, accountants and auditors should have high standards of integrity.

Capable accountants and auditors may advance rapidly; those having inadequate academic preparation may be assigned routine jobs and find promotion difficult. Many graduates of junior colleges and business and correspondence schools, as well as bookkeepers and accounting clerks, who meet the education and experience requirements set by their employers, can obtain junior accounting positions and advance to positions with more responsibilities by demonstrating their accounting skills on the job.

Beginning public accountants usually start by assisting with work for several clients. They may advance to positions with more responsibility in 1 or 2 years, and to senior positions within another few years. Those who excel may become supervisors, managers, or partners; open their own public accounting firm; or transfer to executive positions in management accounting or internal auditing in private firms.

Management accountants often start as cost accountants, junior internal auditors, or trainees for other accounting positions. As they rise through the organization, they may advance to accounting manager, chief cost accountant, budget director, or manager of internal auditing. Some become controllers, treasurers, financial vice presidents, chief financial officers, or corporation presidents. Many senior corporation executives have a background in accounting, internal auditing, or finance.

In general, public accountants, management accountants, and internal auditors have much occupational mobility. Practitioners often shift into management accounting or internal auditing from public accounting, or between internal auditing and management accounting. However, it is less common for accountants and auditors to

move from either management accounting or internal auditing into public accounting.

Job Outlook

Employment of accountants and auditors is expected to grow about as fast as the average for all occupations through the year 2012. An increase in the number of businesses, changing financial laws and regulations, and increased scrutiny of company finances will drive growth. In addition to openings resulting from growth, the need to replace accountants and auditors who retire or transfer to other occupations will produce numerous job openings in this large occupation.

As the economy grows, the number of business establishments will increase, requiring more accountants and auditors to set up books, prepare taxes, and provide management advice. As these businesses grow, the volume and complexity of information developed by accountants and auditors regarding costs, expenditures, and taxes will increase as well. Increased need for accountants and auditors will arise from changes in legislation related to taxes, financial reporting standards, business investments, mergers, and other financial matters. The growth of international business also has led to more demand for accounting expertise and services related to international trade and accounting rules, as well as to international mergers and acquisitions. These trends should create more jobs for accountants and auditors.

As a result of the recent accounting scandals, Federal legislation was enacted to increase penalties, and make company executives personally responsible for falsely reporting financial information. These changes should lead to increased scrutiny of company finances and accounting procedures, and should create opportunities for accountants and auditors, particularly Certified Public Accountants, to more thoroughly audit financial records. In order to ensure finances comply with the law before public accountants conduct audits, management accountants and internal auditors will increasingly be needed to discover and eliminate fraud. And, in an effort to make government agencies more efficient and accountable, demand for government accountants should increase.

Increased awareness of financial crimes such as embezzlement, bribery, and securities fraud will also increase the demand for forensic accountants to detect illegal financial activity by individuals, companies, and organized crime rings. Computer technology has made these crimes easier to commit, and it is on the rise. But, development of new computer software and electronic surveillance technology has also made tracking down financial criminals easier, thus increasing the ease and likelihood that forensic accountants will discover their crimes. As success rates of investigations grow, demand will also grow for forensic accountants.

The changing role of accountants and auditors also will spur job growth, although this growth will be limited as a result of financial scandals. In response to demand, some accountants were offering more financial management and consulting services as they assumed a greater advisory role and developed more sophisticated accounting systems. Since Federal legislation now prohibits accountants from providing nontraditional services to clients whose books they audit, opportunities for accountants to do non-audit work could be limited. However, accountants will still be able to advise on other financial matters for clients that are not publicly traded

companies, and for nonaudit clients, but growth in these areas will be slower than in the past. Also, due to the increasing popularity of tax preparation firms and computer software, accountants will shift away from tax preparation. As computer programs continue to simplify some accounting-related tasks, clerical staff will increasingly handle many routine calculations.

Overall, job opportunities for accountants and auditors should be favorable. After most States instituted the 150-hour rule for CPAs, enrollment in accounting programs declined; however, enrollment is slowly beginning to grow again as more students are attracted to the profession because of the attention from the accounting scandals. Those who pursue a CPA should have excellent job prospects. However, many accounting graduates are instead pursuing other certifications such as the CMA and CIA, so competition could be greater in management accounting and internal auditing than in public accounting. Regardless of specialty, accountants and auditors who have earned professional recognition through certification or licensure should have the best job prospects. Applicants with a master's degree in accounting, or a master's degree in business administration with a concentration in accounting, also will have an advantage. In the aftermath of the accounting scandals, professional certification is even more important in order to ensure that accountants' credentials and ethics are sound.

Proficiency in accounting and auditing computer software, or expertise in specialized areas such as international business, specific industries, or current legislation, may be helpful in landing certain accounting and auditing jobs. In addition, employers increasingly seek applicants with strong interpersonal and communication skills. Because many accountants work on teams with others from different backgrounds, they must be able to communicate accounting and financial information clearly and concisely. Regardless of one's qualifications, however, competition will remain keen for the most prestigious jobs in major accounting and business firms.

Earnings

In 2002, the median wage and salary annual earnings of accountants and auditors were \$47,000. The middle half of the occupation earned between \$37,210 and \$61,630. The top 10 percent of accountants and auditors earned more than \$82,730, and the bottom 10 percent earned less than \$30,320. In 2002, median annual earnings in the industries employing the largest numbers of accountants and auditors were:

Federal Government	\$51,070
Accounting, tax preparation, bookkeeping, and payroll services	49,520
Management of companies and enterprises	49,110
Local government	44,690
State government	42,680

According to a salary survey conducted by the National Association of Colleges and Employers, bachelor's degree candidates in accounting received starting offers averaging \$40,647 a year in 2003; master's degree candidates in accounting were initially offered \$42,241.

According to a 2003 salary survey conducted by Robert Half International, a staffing services firm specializing in accounting and finance, accountants and auditors with up to 1 year of experience earned between \$29,500 and \$40,500. Those with 1 to 3 years of experience earned between \$34,000 and \$49,500. Senior accountants and auditors earned between \$41,000 and \$61,500; managers earned between \$47,500 and \$78,750; and directors of accounting and auditing earned between \$66,750 and \$197,500 a year. The variation in salaries reflects differences in size of firm, location, level of education, and professional credentials.

In the Federal Government, the starting annual salary for junior accountants and auditors was \$23,442 in 2003. Candidates who had a superior academic record might start at \$29,037, while applicants with a master's degree or 2 years of professional experience usually began at \$35,519. Beginning salaries were slightly higher in selected areas where the prevailing local pay level was higher. Accountants employed by the Federal Government in nonsupervisory, supervisory, and managerial positions averaged \$69,370 a year in 2003; auditors averaged \$73,247.

Sources of Additional Information

Information on accredited accounting programs can be obtained from AACSB International—Association to Advance Collegiate Schools of Business, 600 Emerson Rd., Suite 300, St. Louis, MO 63141. Internet:

<http://www.aacsb.edu/accreditation/AccreditedMembers.asp>

Information about careers in certified public accounting and CPA standards and examinations may be obtained from American Institute of Certified Public Accountants, 1211 Avenue of the Americas, New York, NY 10036. Internet:

<http://www.aicpa.org>

Information on CPA licensure requirements by State may be obtained from National Association of State Boards of Accountancy, 150 Fourth Ave. North, Suite 700, Nashville, TN 37219-2417. Internet: <http://www.nasba.org>

Information on careers in management accounting and the CMA designation may be obtained from Institute of Management Accountants, 10 Paragon Dr., Montvale, NJ 07645-1760. Internet: <http://www.imanet.org>

Information on the Accredited in Accountancy, Accredited Business Accountant, Accredited Tax Advisor, or Accredited Tax Preparer designations may be obtained from Accreditation Council for Accountancy and Taxation, 1010 North Fairfax St., Alexandria, VA 22314. Internet: <http://www.acatcredentials.org>

Information on careers in internal auditing and the CIA designation may be obtained from The Institute of Internal Auditors, 247 Maitland Ave., Altamonte Springs, FL 32701-4201. Internet: <http://www.theiia.org>

Information on careers in information systems auditing and the CISA designation may be obtained from Information Systems Audit and Control Association, 3701 Algonquin Rd., Suite 1010, Rolling Meadows, IL 60008. Internet: <http://www.isaca.org>

Information on careers in government accounting and the CGFM designation may be obtained from Association of Government Accountants, 2208 Mount Vernon Ave., Alexandria, VA 22301. Internet: <http://www.agacgfm.org>

Information on obtaining an accounting or auditing position with the Federal Government is available at <http://www.usajobs.opm.gov>.

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