



Occupational Outlook Quarterly

U.S. Department of Labor
U.S. Bureau of Labor Statistics
Summer 2013 · www.bls.gov/ooq



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Apprenticeship:

Earn while you learn



I like that I can have a full-time job and pay my mortgage while going to school,” says chef’s apprentice Brian Schmitt of Davenport, Iowa. “And I like that my job is directly applicable to the work that I want to do.”

Many people work and learn at the same time. But in addition to getting a paycheck, apprentices like Schmitt are also getting a career boost: their on-the-job experience and technical instruction are part of a formal program to help them master an occupation.

Formal apprenticeship programs connect jobseekers who want to learn new skills with employers who want to train workers in jobs that use those skills. Most programs last about 4 years, although some take as little as 1 year and others as long as 6 years. At the end of a registered apprenticeship program, apprentices get a nationally recognized certificate of completion as proof of their skills.

But it’s not always easy to find apprenticeship programs. It helps to know where to look—and what to look for.

This article is an overview of registered apprenticeships. The first section explains what apprenticeship programs are, some of the occupations they prepare you for, and what advantages they offer. The second section describes how to find, choose, and apply for an apprenticeship. The third section helps you plan for success. The fourth section has sources for more information. Testimonials from apprentices appear throughout the article.

About apprenticeships

Whether you’re new to the labor force, changing careers, or just looking to expand your skills, there might be an apprenticeship that appeals to you.

People start apprenticeships at almost any age, but many apprenticeship sponsors require participants to be at least 18. Although many apprentices have a high school diploma or equivalent, others have more or less education than that. And about 7 percent of active registered apprentices nationwide in 2012 were



veterans, according to the U.S. Department of Labor (DOL).

Most formal apprenticeship programs are registered with DOL. These programs prepare workers for occupations in industries such as construction, manufacturing, and healthcare. The opportunity to earn money, train for an occupation, and build a career foundation are just some of the benefits.

Registered apprenticeship programs

Registered apprenticeships must meet certain guidelines set by DOL. People who complete these programs receive a nationally recognized certificate of completion, either from DOL or from an approved state agency.

According to DOL, there were more than 358,000 registered apprentices in more than 21,000 apprenticeship programs in 2012. The actual number of apprenticeships may be higher, however, because DOL and state apprenticeship agencies do not oversee all programs.

Apprenticeship programs are sponsored by individual employers, employer

Elka Torpey

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associations, and labor unions. Sponsors pay wages, which often start out at about half those of a fully qualified worker. Wages increase as registered apprentices advance in the occupation.

For most programs, apprentices must complete 2,000 hours of on-the-job training and at least 144 hours of related technical instruction each year. Apprentices usually work full-time, under the direction of experienced workers, to meet training requirements.

Many apprentices receive their technical instruction by attending classes at an apprenticeship training center, technical school, or community college. Apprentices may go to class 1 or 2 days a week, either before or after work, or go to school full-time for several weeks each year. Frequently, sponsors pay for this technical instruction.

Apprenticeable occupations

In 2012, DOL counted more than 250 occupations with registered apprentices. Apprenticeship isn't the only way to prepare for many

of these occupations, but it's often a popular way. (A box on page 12 describes alternatives for preparing to work in an occupation if you can't find an apprenticeship in it.)

According to the U.S. Bureau of Labor Statistics (BLS), apprenticeship is a typical entry path for 15 occupations:

- Boilermakers
- Brickmasons and blockmasons
- Carpenters
- Electricians
- Elevator installers and repairers
- Funeral directors
- Glaziers
- Mechanical insulation workers
- Plumbers, pipefitters, and steamfitters
- Real estate appraisers and assessors
- Reinforcing iron and rebar workers
- Sheet metal workers
- Stonemasons
- Structural iron and steel workers
- Terrazzo workers and finishers

The table shows the 10 occupations with the largest number of registered apprentices in

Most popular apprenticeship occupations and median hourly wage of all workers in the occupation, 2012

Occupation	Active apprentices, fiscal year 2012	Median hourly wage, May 2012
Electrician	36,742	\$23.96
Carpenter	15,479	19.20
Plumber	13,201	23.62 ⁽¹⁾
Pipe fitter	8,586	23.62 ⁽¹⁾
Construction craft laborer	7,947	14.42 ⁽²⁾
Sheet metal worker	7,714	20.81
Roofer	5,479	16.97
Structural steel/ironworker	5,041	22.18
Painter	3,560	16.92 ⁽³⁾
Pipe fitter (sprinkler fitter)	3,266	23.62 ⁽¹⁾

⁽¹⁾ Data are for plumbers, pipefitters, and steamfitters.

⁽²⁾ Data are for construction laborers.

⁽³⁾ Data are for construction and maintenance painters.

Note: Data for active apprentices are from the Registered Apprenticeship Partners Information Management Data System (RAPIDS). RAPIDS is used by 33 states: 25 Office of Apprenticeship states and 8 of the 25 State Apprenticeship Agency states.

Sources: U.S. Department of Labor Office of Apprenticeship (active apprentices data), U.S. Bureau of Labor Statistics Occupational Employment Statistics program (wage data).

2012, according to DOL. All of these occupations are in construction, but occupations in other career areas also have apprenticeships.

Descriptions of some apprenticeship career areas are listed below, along with examples of occupations categorized in each area and typical length of apprenticeship program for each. For apprenticeships that do not match a title in the Standard Occupational Classification (SOC) manual, a SOC title is given in parentheses. Career areas and occupations are arranged roughly in order of the number of registered apprentices in 2012.

Construction. Construction workers build and repair homes, office buildings, and other structures. Common construction apprenticeships include:

- Electricians, 4 years
- Carpenters, 4 years
- Plumbers, 3 or 4 years
- Construction craft laborers, 2 years
- Pipefitters, 4 or 5 years.

Installation, maintenance, and repair.

Workers in this group install and fix goods and equipment. Apprenticeable occupations in this group include:

- Millwrights, 3 or 4 years
- Line repairers and maintainers (Line installers and repairers), 3 or 4 years

- Heating, air conditioning, and refrigeration mechanics and installers, 3 years
- Telecommunications equipment installers and repairers, except line installers, 3 or 4 years
- Automobile mechanics (Automotive service technicians and mechanics), 4 years.

Production. These workers operate machines and equipment to manufacture goods. Occupations with apprentices include:

- Machinists, 3 or 4 years
- Machine operators (Multiple machine tool setters, operators, and tenders, metal and plastic), 1 year
- Tool and die makers, 4 years
- Welders, 3 years
- Cabinetmakers, 4 years.

Food, personal care, or child care.

Workers in this group make food or provide personal care or services to the public.

Apprenticeable occupations include:

- Cooks, 2 or 3 years
- Bakers, 3 years
- Childcare development specialists (Childcare workers), 2 years
- Barbers, 1 year
- Animal trainers, 2 years.





Testimonial

- **Apprentice:** Tyrell Ellis (Mattapan, Massachusetts)
- **Occupation:** Sheet metal worker
- **Sponsor/program:** Union, joint training organization
- **Status:** First year of a 5-year program

I did a preapprenticeship program called Building Pathways. It was a brilliant program. If it weren't for that program, I wouldn't be where I am today. That program gave me an opportunity to get a taste for every trade that was out there, and at the end I got to pick which ones I liked best. It also gave me an idea of what to expect with the union and with an apprenticeship.

The people at the preapprenticeship also helped me get references and fill out applications. I wanted to be a sheet metal apprentice, and I was lucky because they were taking people in.

Building Pathways was a preapprenticeship program for low-income housing authority residents. I was out of work, saw the flyer in my building, and took a chance. It's the best thing that ever happened to me.

Protective service. By providing a range of services in their communities, these workers help to keep people safe. Occupations with apprentices include:

- Correctional officers, 1 year
- Wildland firefighter specialists (Forest firefighters), 2 years
- Firefighters, 3 years
- Police officers, 2 years
- Paramedics, 2 years.

Healthcare. Workers in this group help to administer care in hospitals, doctor's offices, nursing facilities, and other settings. Health-care occupations that offer apprenticeships include:

- Pharmacy support staff (Pharmacy technicians), 1 year
- Nursing assistants, 1 year
- Long-term care nurse managers (Medical and health services managers), 1 year
- Dental assistants, 1 year
- Home health aides, 1 year.

Architecture, engineering, or computers. These workers use specialized knowledge to design or work with concepts, systems, or structures. Occupations with apprentices include:

- Mine inspectors (Mining and geological engineers, including mining safety engineers), 4 years
- Electromechanical technicians, 3 years
- Computer programmers, 2 years
- Utilities instrument technicians (Electronics engineering technicians), 4 years
- Computer operators, 3 years.

Other. People apprentice in a wide range of other occupations. These include:

- Heavy truck drivers, 1 year
- Administrative services managers, 2 years
- Landscape technicians (Landscaping and groundskeeping workers), 2 years
- Decorators (Merchandise displayers and window trimmers), 4 years
- Tree trimmers, 2 years.

Advantages of an apprenticeship

Apprenticeship programs have many advantages, including a paycheck, hands-on training, technical instruction—which is often free—and a solid start to a career.

A paycheck. Apprentices start earning money right away, which is a big draw for many who choose this type of career preparation. In addition to wages, some apprentices are eligible for health insurance or other employee benefits.

Apprentices usually make at least minimum wage. As apprentices' skills progress, their wages typically increase. "You're going to start off pretty low on the salary scale because you're preparing for a trade that takes a long time to learn," says Drew Haigh, a moldmaker apprentice in San Dimas, California. "You'll make your money over time."

According to DOL, the average wage for a journey-level, or fully qualified, worker who completed an apprenticeship in 2012 was \$24.77 an hour, or \$51,522 a year. And a 2012 DOL-sponsored report by Mathematica Policy Research found that people who completed

Testimonial

- **Apprentice:** Dan Glass (Delta Junction, Alaska)
- **Occupation:** Outside lineman
- **Sponsor/program:** Union, joint training organization
- **Status:** Final year of a 4-year program

It took years for me to get into my program. I first applied and waited for 4 years, and I missed the call. I then reapplied and waited for 2 years.

It's an open application timeframe. You pay \$25 and apply. During the interview, they sit you down and go through the work process. There were six journey-level line workers who asked questions.

The people in my class are all in our third year now. At first we worked on the ground. Then we did "hot work" (working with electricity) under supervision. Now we're "high-time apprentices," meaning we do aerial work without hand-holding [by our supervisors].

The pay is awesome. But you have to be open to traveling once you finish your apprenticeship. And you can't be scared of heights.



their apprenticeships have higher average lifetime earnings than those who did not.

But even before they earn journey-level wages, some apprentices say that their starting wage is an improvement over what they had been making. For example, Tyrell Ellis earns about \$17 an hour in his first year as a sheet metal worker apprentice in Mattapan, Massachusetts. “Before the apprenticeship I was making \$10 an hour, working all kinds of hours,” says Ellis. “I would have to work nonstop every day to make what I make now.”

Testimonial

- **Apprentice:** Bob Solden (Petaluma, California)
- **Occupation:** CNC (computer numerical control) machinist
- **Sponsor/program:** Independent employer, California apprenticeship program
- **Status:** First year of a 4-year program

I’ve been a tradesworker since I got out of high school, doing work related to painting, roofing, and plumbing. I was cleaning pools for a living when I heard about an opening at a machine shop for a CNC operator. It was a lot of pushing buttons at first, but now I have more responsibility.

I found out about the apprenticeship program because one of my coworkers told me he was going to school and the company was paying for it. So I asked the owner of the company, and he said that the opportunity was definitely there. He wanted to see if I had the wherewithal to do it, and he decided it was something that I could benefit from and he could benefit from.

I have classes once a week, Thursday nights from 6 to 10 p.m. At work, we have lead machinists who’ve been in the field and take the time out to train us on job tasks.

My best advice would be, don’t wait. If you really want to become an apprentice, I would look into everything I possibly could. When applying at a machine shop, ask if they offer an apprenticeship program. If not, I’d recommend looking other places.

Hands-on training. While on the job, apprentices learn practical skills from experienced workers. Having worked under many mentors has helped Dan Glass to develop a wide range of skills. “You learn something different from everyone,” says Glass, a third-year outside lineman (power line installer and repairer) apprentice in Delta Junction, Alaska.

By the end of their apprenticeship, people usually have had experience with all of the major aspects of their occupation. “It’s an effective way to learn,” says Schmitt. He adds that because apprentices get their skills on the job, they don’t face the same learning curve that many inexperienced workers do when they begin a new job.

Technical instruction. Apprentices receive related technical instruction that they use on the job. “When you go to work the next day, you get to apply what you’ve learned,” says Monique Gerard, who recently finished a steamfitter apprenticeship in Peoria, Illinois. “You really get to hone your skills.”

Apprentices’ technical instruction is usually provided by people who work in the industry, and their sponsor frequently pays.

Completed classes may count toward certification or licensure requirements, which help boost apprentices’ credentials and are sometimes necessary to work in an occupation. Some apprentices earn college credits or an associate’s or bachelor’s degree during their program.

And apprentices often appreciate how much they gain from the instruction. “I’ve learned so much in my class this past year that it’s really amazing,” says Bob Solden, in his first year of a CNC (computer numerically controlled) machinist apprenticeship in Petaluma, California. “I feel like I’m gaining so much knowledge.”

Build a career foundation. At the end of their programs, apprentices earn a certificate of completion, issued by DOL or a state apprenticeship agency. This certificate is recognized by employers around the country.

Because apprentices’ credentials are widely accepted, people who have finished an apprenticeship program frequently have

increased occupational mobility. “It puts you in a position where you can go anywhere in the United States and get a job in a short amount of time at a decent wage, rather than having to start out at the entry level,” says Schmitt.

During the course of an apprenticeship program, apprentices are encouraged to make contacts in their industry. This networking may help them get a job when they reach journey-level status. Some apprentices finish the program and then start a career with the same employer who sponsored them.

Getting an apprenticeship

Getting an apprenticeship is similar to getting a job: you need to find a program, apply for an opening, and qualify for selection.

Finding apprenticeships

Apprenticeships involve commitment, so you’ll need to find and choose a program that’s right for you.

Search for programs. You can look for apprenticeship openings in a variety of ways. State apprenticeship agencies are often a good resource and usually keep lists of apprenticeships. Another way to identify apprenticeship programs is to visit an American Job Center.

You might also search for apprenticeships advertised in a newspaper or online. Or you can contact a local union or other apprenticeship sponsor directly to ask about opportunities. DOL’s Office of Apprenticeship website provides contact information for all of the sponsors in the registered apprenticeship database, searchable by state and county.

In addition, community colleges and other schools sometimes post openings for available apprenticeships, which may be offered as part of an educational program. Some workers approach their employer about creating an apprenticeship position in a job they already have.

To find apprenticeships by occupation, visit DOL’s My Next Move website. (Details are available in the “For more information” section, which begins on page 12.)

Testimonial

- **Apprentice:** Monique Gerard (Peoria, Illinois)
- **Occupation:** Steamfitter
- **Sponsor/program:** Union, joint training organization
- **Status:** Completed a 5-year program in September 2012

Our union puts out apprenticeship testing every 2 years. Traditionally, it’s been published in the newspaper, but this year they updated our website to reflect when the application and testing dates are.

The union sponsors apprentices. They get calls from contractors, who might say, “I need 20 people for 40 hours a week.” The union hall calls you, you work for 40 hours, and then you’re laid off. Then, when there is more work, you’re sent off to do it.

Each job requires a certain skill set. On one job, you might be rigging big pieces of pipe. On the next job, you might be running drain lines. You get a lot of work experience and the opportunity to work with people who’ve been doing this for 30 or 35 years. At the end, you realize exactly how much you’ve learned, and it’s pretty surprising.



Special programs. Some programs are designed for specific groups. For example, school-to-apprenticeship programs allow high schoolers in some states to get started in an apprenticeship while they are students. Apprenticeships for active-duty service members provide training in some military occupations. And some correctional institutions offer programs for inmates.

Preapprenticeship programs are another option. These programs help people qualify and prepare for apprenticeships. Participants might learn about career options and what an apprenticeship involves, for example, while they develop occupational skills.

Choosing a program. Apprenticeships vary in their schedules, pay, costs, technical instruction, and other details. Costs, for example, might include application fees, union dues, school tuition, books, and tools or other equipment, such as safety boots or uniforms.

Before you choose a program, it is important to learn about the occupation you're interested in. Talk to people in the occupation or tour a jobsite to get a better sense of the work culture and tasks.

Gerard didn't really know what steamfitters did until she asked someone about the basics of the work. After learning more about it, she decided to apply—and is glad she did. "I've never been happier in any job in my life," Gerard says. "The skilled trades are fantastic to get into. I am doing something productive and important."

Application and selection

To get an apprenticeship, you must first apply for one. Apprentices are typically chosen through a competitive process, which often involves interviews, rankings, and other factors.

Applying. Apprenticeship requirements vary by sponsor and program. For many programs, you must be at least 18 years old and have a high school diploma or equivalent.

You might also need to have completed certain classes in school or to pass an aptitude test in subjects such as math, physics, and reading comprehension. Related work experience is sometimes necessary. And some programs require drug tests or a physical exam to verify that you are able to do key tasks in the occupation.



When you apply for an apprenticeship program, you may need to pay a fee of about \$20 to \$45 and submit other material. This supplemental material might include written recommendations, school transcripts, and proof of identification, such as a birth certificate or driver's license.

Interviews. Applicants who meet the initial requirements usually have one or more interviews with their prospective sponsor. Interviewers want to know more about your qualifications, that you'll be reliable, and whether you are really interested in doing the work.

Prepare for an apprenticeship interview as you would for a job interview: dress nicely, think about how you will answer common interview questions, and be ready to discuss your work-related skills and interests.

In addition, sponsors usually want to know that you understand the work involved in the occupation you will train for. "Before they invested in me, they wanted to make sure I was completely devoted to it," says Haigh. "You have to be really committed to want to do a 4-year apprenticeship."

Rankings. Qualified apprenticeship applicants are often ranked on factors such as aptitude test results, interview performance, education, and work experience. As sponsors need apprentices, the most competitive applicants—those with the highest rankings—are chosen first. Applicants with lower rankings might need to wait until there's another opening.

The wait may last several weeks to several years. Gerard, for example, had to wait for 6 months before being contacted about an opening. Sometimes, people apply for an apprenticeship more than once.

Networking. For apprenticeship applicants, like for jobseekers, networking can be beneficial. It allows you to meet people in the occupations you might be apprenticing for and helps you to learn more about a program. Applicants might also gain a better sense of what to expect in an apprenticeship.

In addition, your networking contacts may recommend you to sponsors. "Definitely

Testimonial

- **Apprentice:** Brian Schmitt (Davenport, Iowa)
- **Occupation:** Chef
- **Sponsor/program:** Individual employers, community college, regional apprenticeship program
- **Status:** Final year of a 3-year program

I retired from an outside sales career that I was in for about 20 years. It was good money, but I wanted to do something that I enjoyed.

In my program, you get a 2-year associate's degree from a college. Because it's an apprenticeship program, you receive your journey-level card from the U.S. Department of Labor. Part of the curriculum is a practicum class each semester, including summers. The practicums are like a full-time job. Most classes are on Monday, with a 3-hour class in the morning and a 3-hour class in the evening, and then you have the rest of the week off to work in the field.

It's up to the students to choose where they work. You get jobs on your own merit, through interviews and applications. You earn the same wage as anyone hired to do the job. There are about 90 to 100 local restaurants in our area, and they are categorized as entry-level, intermediate, or advanced, based on how much experience you'll get at them.

You learn classical training in school, but at the end of the day, there are shortcuts, things that you learn on the job that you won't learn in school.

make connections, because that's a big part of the application and selection process," says Shamir Turner, a sheet metal worker apprentice from Somerville, Massachusetts. "I'm not sure I would have gotten into my apprenticeship program if I hadn't known someone who could vouch for me."

Plan for success

Those who are in or have completed apprenticeships have a few pointers to help prospective apprentices succeed.

For example, Schmitt says that apprentices should remember that they are entry-level workers. “Set your expectations realistically,” he says. “Be willing to pay your dues for a few years, and don’t get discouraged if you’re not running the show.”

Ellis agrees. “Expect to be the lowest one on the totem pole and to do whatever is asked of you, even if it’s just getting coffee,” he says.

Others who’ve succeeded encourage apprentices to take advantage of any additional training or certification programs offered to them. Apprentices should also try to learn as much as they can from their mentors about different aspects of the work.

“What you get out of it,” says Schmitt, “is what you put into it.”

For more information

To research occupations you might be interested in, use the BLS *Occupational Outlook Handbook (OOH)*, available at www.bls.gov/ooh. The *OOH* describes what workers do, ways to enter an occupation, pay, and more information for hundreds of occupations.

DOL’s registered apprenticeship site has a variety of resources, including more information on what apprenticeships are and how to

Beyond apprenticeships: Other paths to occupational entry

If you know the occupation you want to enter but can’t find an apprenticeship in it, you still have options. Most occupations that have an apprenticeship also have other paths for beginning workers.

Alternative ways to prepare for an occupation might include gaining experience in a related occupation, earning an associate’s or bachelor’s degree, getting a certificate or diploma, or some combination of these. Entry requirements for occupations vary by state and individual employer, just as they do for apprenticeships.

Get experience. If you’re interested in a specific occupation, look for entry-level jobs in the field or related to that line of work. Jobs in certain apprenticeable occupations, such as home health aides, may be available to people without related experience.

You might also look for a job as a helper in the occupation, such as a construction laborer helper. Starting out in this way might give you a better sense of whether you like the work and which occupational specialties you might want to pursue.

Earn a degree. Community colleges offer associate’s degree programs that prepare

workers for a range of occupations, usually in about 2 years. Colleges and universities offer bachelor’s or higher degree programs, many of which provide occupation-specific education in 4 years or more. And students who have formal internships or co-op jobs during school get hands-on experience similar to that of apprentices.

Schools charge tuition, but you might qualify for financial aid. To learn more about how to finance a college education, see “Paying for college: Strategies to afford a higher education today,” in the spring 2013 issue of the *Quarterly* at www.bls.gov/ooq/2013/spring/art01.htm.

Get other credentials. Career schools, such as vocational, technical, and trade schools, offer certificates and diplomas to help prepare workers for occupations such as dental assistant or heating, air conditioning, and refrigeration mechanic or installer. These programs usually last 2 years or less and teach job-specific skills. To learn more, see the article on certificate programs in the winter 2012–13 issue of the *Quarterly* at www.bls.gov/opub/ooq/2012/winter/art01.htm.

get them, at www.doleta.gov/oa. For example, the DOL site provides:

- State apprenticeship agency and related information at www.doleta.gov/OA/sainformation.cfm
- Detailed contact information for apprenticeship sponsors by state and county at <http://oa.doleta.gov/bat.cfm>
- Pathways to Success, an online tool that allows you to search for many apprenticeship opportunities, preapprenticeship programs, and community college partners by state or zip code at www.doleta.gov/OA/pathways.cfm.

To search for apprenticeship openings by occupation, or to learn more about an occupation and its apprenticeship options, visit My Next Move at www.mynextmove.org. On an occupation's profile page, click the "Find Jobs" link under the "Job Outlook" section. Then, select a state to get job listings from the mySkills myFuture website or to find state and national job banks, many of which include apprenticeship openings. You can also click the "Registered Apprenticeship" link in the "Education" section on a job page and select a state to learn more about its apprenticeship programs, sponsors, and agency contact information.

Learn more about the United Services Military Apprenticeship program at <http://usmap.cnet.navy.mil/usmapss/static/usmap.jsp>.

For a full list of apprenticeable occupations, go to www.iowaworkforce.org/apprenticeship/apprenticeableoccupations.pdf.

DOL's CareerOneStop website has links to resources, including to apprenticeship information, for jobseekers and others interested in careers. Visit www.careeronestop.org/educationtraining/find/apprenticeshipoffices.aspx.

American Job Centers also provide resources for jobseekers and might be a source of information about apprenticeships opportunities. To find a center near you, go to www.servicelocator.org/onestopcenters.asp.



Unions and trade organizations are often a good source of information about apprenticeships. Among the many organizations that have apprenticeship information are local chapters of the following:

- International Brotherhood of Electrical Workers, www.ibew.org
- United Association of Journeymen and Apprentices of the plumbing and pipefitting industry (for plumbers, fitters, welders, and HVAC service technicians), <http://ua.org/careers.asp>
- United Brotherhood of Carpenters, www.carpenters.org

ooq

My career

Web operations engineer

Jason Thomas



Mineola, New York

BLS fast facts: Network and computer systems administrators

- May 2012 employment: 350,320 (excludes self-employed workers)
- 2010–20 projection: 28 percent growth (faster than average)
- May 2012 median annual wage: \$72,560
- Typical education and training: Bachelor's degree
- May 2012 top-employing industries: Computer systems design and related services; management of companies and enterprises; colleges, universities, and professional schools; elementary and secondary schools; and wired telecommunications carriers

What do you do?

I provide technical support for the Web developers who manage two of my company's most popular websites. Whenever the developers run into a problem they can't fix, I help them find solutions.

Every problem is different, so I need to understand all the systems that make the websites work: databases, programming, networking, and lots more. By comparison, a Web developer usually only needs to know Web programming but will know it better than I do.

I also maintain the computer servers that host the two websites. These websites offer software applications that enhance our products. And to keep up with user demand and to accommodate new visitors, I have to improve how the current systems work and add more servers, sort of like remodeling and expanding a house.

To help me add new servers, I develop automation tools that act like a printing press.

For example, I can bundle into a single template all the tools, settings, and data a server needs to work with one of our websites, and then easily install the template on as many servers as that website needs.

Describe your educational background.

When I started my bachelor's degree in computer engineering, I didn't know what my career would be. But I was sure I wanted to work with computers. Computer engineering comes in two "flavors": hardware (electrical engineering) and software (computer science). I concentrated in computer hardware for my bachelor's degree but switched to software for my master's degree because I was already working with software as a systems administrator.

The most important things you learn in school come not from the material but from the professors' experience in the field. They can provide examples of real problems, their thinking process, and how they found a

solution. But no textbook or course can keep up with how fast the industry is changing. Little of what I learned 5 years ago is still applicable today.

What was your first job out of college?

I started as a systems administrator in an internship I discovered at one of my school's career fairs. I was eventually hired full time. I dealt with a variety of basic problems that took minutes to solve. For example, if a customer had trouble accessing the server, I might have solved the problem with a simple password reset. The problems I deal with today can take hours to solve, but that experience helped me build a foundation of knowledge that I still use.

The best way to encounter more problems and learn more solutions is by getting experience. In technology, there is no one solution—but there certainly are wrong ways of approaching a problem. My job is to find the most efficient solution.

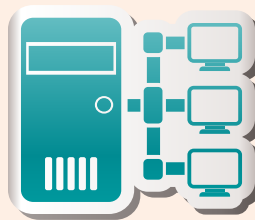
How did you get this job?

I've been in my field for 5 years now, so I have met a lot of professional systems administrators. One of these contacts in my network recommended me for an open position at the company where he works.

What else led you here?

I've been working with computers since I was young. I started my first computer job when I was 15 years old. I was passionate about the work, so I decided to pursue a computer engineering degree.

After my first job out of college, I worked for a national media company as an associate systems engineer. The work was similar to what I did in my first job, but I also had the opportunity to take on more problems. I was then promoted to a systems engineer doing even more difficult work. Two years later,



when I no longer felt challenged by my job, I joined a start-up company.

At this start-up company, I had more responsibilities and less help. I had to learn to be more creative with my solutions to reduce costs and time. Five months later, I joined the company I now work for.

What's been one of your biggest challenges?

When I started working remotely from home, I found it difficult to communicate with my coworkers. I couldn't walk to their cubicle or talk over lunch. I mostly read emails. It was affecting my work. For example, I would have trouble figuring out whom to approach for help with a specific problem because I knew little about my coworkers or what they could do.

I had to put in a lot of effort to know them better. Whenever I went to the main office, I introduced myself and socialized. I also set up a chat room for us to talk online during the day and after hours.

What's your best advice?

Job experience and networking are crucial. Working as an intern while pursuing a degree will help you land your first job. Once you have a bachelor's degree, experience usually trumps education. Networking will help you throughout your career. You can learn new things from the people you meet and get your name recognized, for example.

The work is demanding and, especially early on in your career, you might be on call. You have to really want to do this. Professionals in my field are motivated and self-driven. Seek new challenges—not more money. ∞

Jason Thomas was interviewed by Dennis Vilorio, an economist in the Office of Occupational Statistics and Employment Projections, BLS. Dennis can be reached at (202) 691-5711 or vilorio.dennis@bls.gov.

From script to screen: Careers in film production



Films are more than entertainment. They inspire, inform, and may even become part of our culture. And for many people, films also offer jobs and a career path.

The glamour of Hollywood and the creativity of filmmaking attract droves of people looking to work on the next big blockbuster—and for good reason. According to the Motion Picture Association of America, box office revenues in the United States and Canada reached \$10.8 billion in 2012, a 6-percent increase from 2011. And thanks to advances in technology, it's never been easier, faster, or more affordable for people to make their own films.

But working in this industry is not always as glamorous as it seems. For example, finding steady work is difficult and wages are generally low. A passion for film helps workers overcome these and other challenges. “The work is hard,” says supervising sound editor Kevin Hill, “so if you love it, you’ll be more likely to stick through the tough times.”

This article describes many of the occupations in film production. The first three sections describe the typical work duties of and training required for key occupations in each phase. Other sections offer pros and cons of working in the film industry, jobseeking tips for starting a film career, and resources for additional information.

A graphic on page 18 follows the lifecycle of a film. It shows the work performed during each phase of the filmmaking process: preproduction, production, and postproduction.

Although the article focuses mainly on feature film production, the information generally applies to other types of video productions, such as TV shows, music videos, and other kinds of film.

Occupations in preproduction

Preproduction is the initial phase of a film’s creation and can last months or even years. This work includes developing the script,



auditioning the actors, and planning how each scene will be shot.

Occupations involved in preproduction include screenwriters, producers, and directors.

Screenwriters

Screenwriters write or adapt the film’s story into a script. The story may exist in another form, such as a novel or play, or may be based on actual events. Other times, screenwriters write the script from their own ideas.

For an adaptation, screenwriters must first obtain the legal rights to use the material and then rewrite this material to suit their purposes. They may keep much of the source material or make big changes and insert some of their own ideas. For scripts based on actual events, screenwriters research the events and then write the script based on the research. For an original story, screenwriters brainstorm ideas before beginning to write. They may have a colleague edit the script and make suggestions.

When the script is done, screenwriters find a producer willing to fund the project. They work with the producer and director during preproduction to discuss, edit, and develop the script.

(Continued on page 19)

Sara Royster
and Dennis
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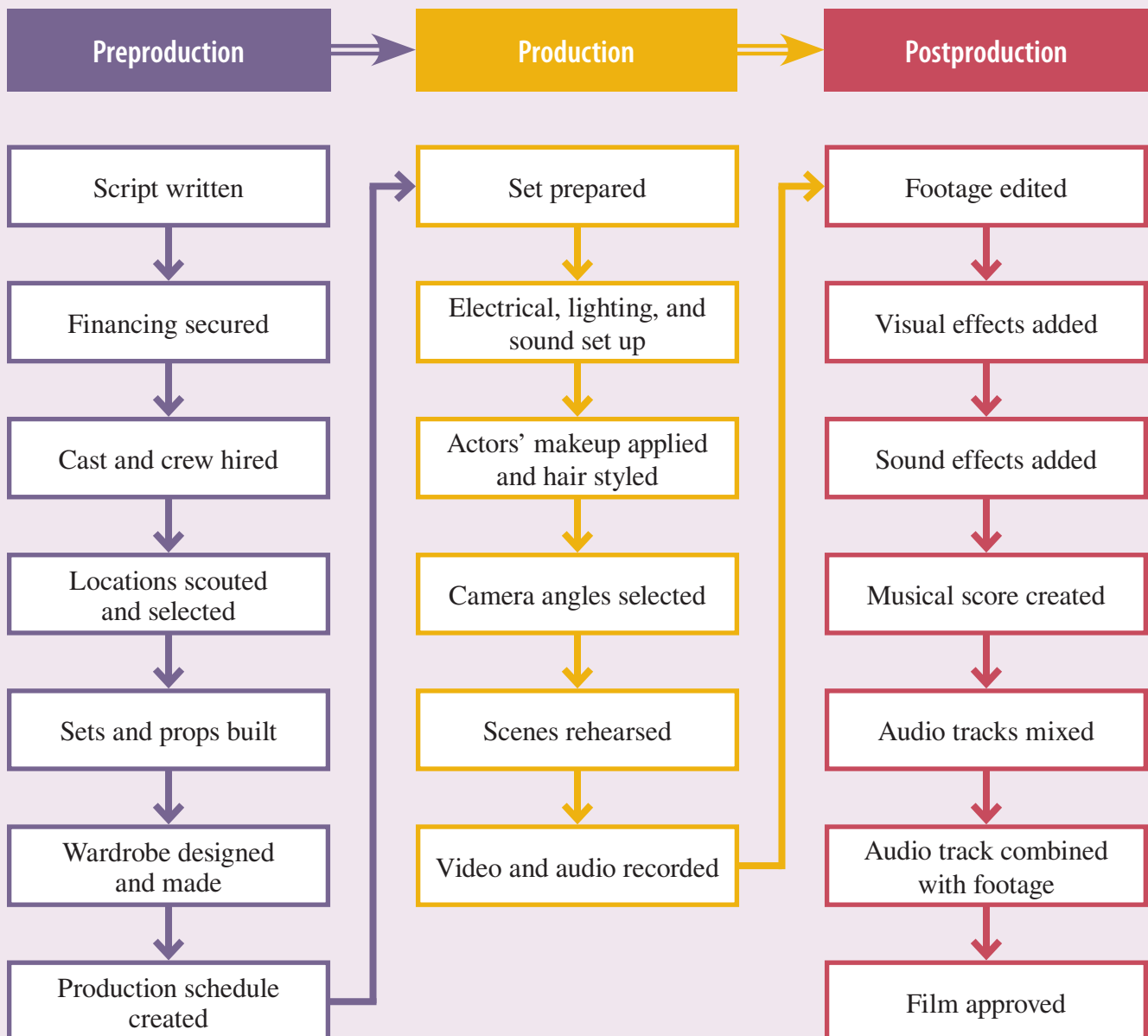
Lifecycle of a film

Filmmaking typically involves three phases: preproduction, production, and postproduction. In preproduction, preparations are made for recording the film's footage. During production, the film is shot on set with the cast and crew. And in postproduction, the footage is edited and refined to complete the film.

Different filmworkers have varying degrees of involvement in each phase. Some workers, such as producers and directors, are involved throughout the lifecycle of the film. Others, such as visual effects artists who work with completed footage, may have

minimal involvement in one phase and do most of their work in another. Filmworkers' tasks are described in the article but are not included in the graphic.

This graphic follows the lifecycle of a film from script idea to final approval. Every major step is outlined for each of the phases. Although the complete lifecycle can last a few months to a few years, the steps shown in production repeat daily during that phase. In addition, some steps happen simultaneously within each phase.



(Continued from page 17)

Skills and training. Writing down ideas and transforming them into scripts is one of the easiest ways to begin screenwriting. “The great thing about screenwriting is that it’s easy to get started,” says screenwriting teacher Matt McNevin. “All you need is a pen and paper.”

That doesn’t mean screenwriting itself is easy. “Learning to write a screenplay is like learning a new language,” says McNevin. Because screenwriting is its own style of writing, taking a screenwriting class is often useful.

But a single class is often not enough to learn all the skills necessary to turn ideas into scripts, so many screenwriters have a bachelor’s degree. A master’s degree in film or a related field also may be beneficial.

Producers and directors

Producers and directors make the business and creative decisions for a film. Usually, their responsibilities remain largely separate. But occasionally, their work overlaps—and one person may do the job tasks of both occupations.

Producers. Producers are a film’s managers, beginning with securing the financing in preproduction to approving the completed film in postproduction. “You shepherd the project from script to screen,” says producer-director Michael Merino. “You are responsible for everybody and everything.”

Producers’ financial responsibilities include finding the money to fund a film, making sure the film stays on budget, and being accountable for the film’s financial success. In preproduction, producers take a script that they are interested in making into a film and meet with potential investors to ask for their financial support. If someone agrees to invest money in the film, the producer and the investor sign a contract so that work can begin on the project.

From preproduction through postproduction, producers are responsible for the overall supervision of a film. Their duties include



Producers’ financial responsibilities include making sure a film stays on budget.

hiring the director, creating a budget, and approving changes made to the script, budget, or filming schedule.

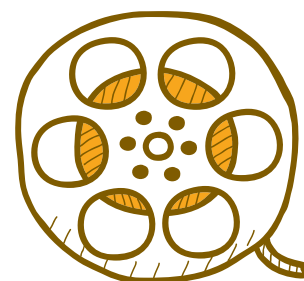
Producers may hire other workers to help with some of these tasks. For example, line producers disburse the money and keep the film on budget.

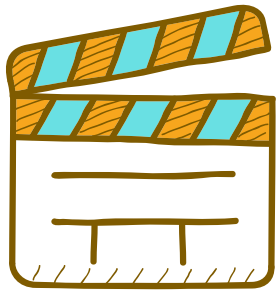
Directors. The director develops and implements the artistic vision for the film.

In preproduction, the director helps audition and choose the cast and works with production designers to create appropriate sets and wardrobe. He or she also collaborates with the producer to write the production schedule.

When a film is ready to begin production, the director oversees the shooting of each scene. To ensure that each take is captured properly, the director works closely with the cinematographer. The director also guides the actors to help them better portray their characters.

After shooting is complete, the postproduction workers, under the director’s guidance, design the music, sound, and visual effects.





Skills and training. Producers and directors need to be organized and be comfortable with multitasking. Creativity, leadership, and communication skills are also important. And money management skills are useful to help keep a film within budget.

Producers and directors usually have a bachelor's degree. They can major in nearly any field, but popular choices include communications, business, and fine arts.

Producers and directors often have years of work experience in a related occupation, such as actor or cinematographer. Because of the nature of their work, they need knowledge of the film production process. "You have to understand every aspect of film," says Merino. Other producers and directors have experience working in business or management.

Occupations in production

Production is the filmmaking phase that includes shooting of the footage. It usually lasts about 1 month for smaller films and up to a few months for larger films. This work includes preparing the set and rehearsing and filming each scene.

Occupations involved in production include assistant directors and production assistants; electric, light, and sound workers; makeup, hair, and wardrobe workers; cinematographers; and actors.

Assistant directors and production assistants

Assistant directors and production assistants work as the director's support staff on the set.

On the set, assistant directors announce the beginning and end of shooting for each take.



They prepare the cast, crew, and set for shooting each day.

Assistant directors are liaisons between the director and the cast and crew. Before shooting begins each day, assistant directors prepare the "call sheets." Call sheets are detailed schedules of what scenes are being filmed each day, which actors and props are in each scene, and what the actors' makeup and wardrobe needs are. Assistant directors also announce the beginning and end of shooting for each take, and they report any problems that arise during filming to the director.

Production assistants perform miscellaneous tasks for the assistant directors, including running errands or bringing actors and props to the set.

Skills and training. Assistant directors and production assistants must be organized and should communicate well to keep the film set running smoothly. They also need to be resourceful to do a diverse assortment of tasks as needed on the set. Leadership skills are useful for assistant directors because they are in charge of most of the other workers on set.

Assistant directors usually have a bachelor's degree in film or a related field of study. Coursework in directing, set design, and audio engineering help assistant directors understand the production process. Many assistant directors work their way up to the position by gaining experience working on film sets in a different occupation, such as production assistant.

Production assistants do not have requirements for formal education or for experience. For this reason, people who aspire to other filmmaking occupations often start out as production assistants to gain experience on a set.

Electrical, lighting, and sound workers

Electrical, lighting, and sound workers set up the lights and electrical equipment during each day of shooting. They also ensure that the wiring is safely placed and is working properly.

Gaffers and grips. Gaffers and grips are in charge of establishing the set's mood through lighting. Gaffers supervise the



Boom operators use a large microphone to capture dialogue and other sounds during shooting.

electricians on a movie set. They design and adjust the lighting scheme that is used during the filming of each scene. For example, if a scene calls for a campfire but a real one cannot be built on set, gaffers use certain lights to recreate the flickering of a fire.

Grips are technicians who carry out the gaffers' lighting plan. Grips also may support the camera operator if the camera is rigged on a dolly or crane. The key grip oversees the lighting department, including the other grips.

Assistants to the gaffer and key grip, known as best boys, manage the day-to-day operations of the electrical and lighting departments. For example, they buy the lights and other electrical equipment needed for the set.

Boom operator and sound technicians.

The boom operator and sound technicians capture the dialogue and sounds on set. While the camera is rolling, the boom operator determines the best place to hold the boom, a large microphone that records the sounds from a scene. When a scene is being shot, the boom operator communicates with the cinematographer to ensure that the boom is not visible on camera during shooting.

Sound technicians ensure that the boom records the sound properly, with no

obstructions from background noise on the set. When shooting for a take begins, technicians use headphones to listen to the sound being recorded. If any unwanted noise can be heard, technicians ask the assistant director to stop shooting.

Skills and training. Technical and problem-solving skills are important for these workers. Manual dexterity is useful for handling the fragile, expensive equipment. Physical endurance is crucial for boom operators because they are often on their feet and holding the boom above their heads for an entire day of shooting.

An associate's degree or vocational certificate is typically required for electrical, lighting, and sound workers. This formal training often includes hands-on experience with the complicated equipment used on set.

Makeup, hair, and wardrobe workers

Hairstyles, makeup, and wardrobe vary by film. For example, the wardrobe could require anything from everyday clothing to elaborate costumes. Makeup artists, hair stylists, and wardrobe designers coordinate their efforts so that the characters' appearances fit the director's vision for the film.

Makeup artists apply basic cosmetics, such as powder and concealer, to each actor's face and body. Some specialized makeup artists, often called effects makeup artists, apply the intricate cosmetics and prosthetics an actor needs to portray a person or creature whose appearance is very different from his or her own.

Hair stylists arrange the actors' hair, based on the characters the actors portray. This can range from simply applying hair-spray to cutting and designing a hairstyle. Hair stylists may also dye actors' hair a different color, if needed, or help them apply an intricate wig or hairpiece.

Wardrobe designers select the appropriate clothing and accessories for all the characters in the film. They meet with the director to discuss the type of clothing the film has and then measure each actor for size. To create the film's wardrobe, these designers buy or tailor existing clothing or buy fabric and sew the costumes from scratch.

During shooting, workers known as wardrobe stylists help the actors get dressed

and put on their accessories, such as jewelry, shoes, and scarves.

Skills and training. Artistry and creativity are essential for makeup, hair, and wardrobe workers. These workers should also be detail oriented and have good interpersonal skills.

Makeup, hair, and wardrobe workers may be required to have an associate's degree or vocational certification. Cosmetology programs offer classes in hair styling and makeup application. Wardrobe designers or costumers often have knowledge of fashion design or textiles. Although formal training is important, experience working on a film set helps these workers learn many of their job skills.

Cinematographers

Cinematographers are in charge of shooting scenes for the film. Also called the director of photography, the cinematographer uses cameras on set to record all the footage necessary for the film.

Cinematographers also determine how the camera should move in each scene to best meet the director's vision. For example,

Artistry and creativity help makeup artists enhance or transform an actor's appearance.



if the director wants the audience to become more emotionally involved in a key scene, the cinematographer might choose to shoot the actors' faces at close range to capture their expressions.

Cinematographers usually lead a team of camera operators who set up, operate, and store the camera equipment. On some film projects, there is also a second team of camera operators who shoot supplemental footage, known as a B-roll. The B-roll includes things such as background and transition shots of landscapes.

Skills and training. Cinematographers must be creative and imaginative, as they determine what the audience will see on the big screen. They also need good technical skills to operate complex camera equipment. And being detail oriented is important, because cinematographers must ensure continuity for each take, with the lighting, props, and actors in precisely the same places.

A bachelor's degree in film or a related field of study is usually necessary to become a cinematographer. Knowledge of camera technology and video editing software is essential. Cinematographers often gain experience working on a film set in another occupation, such as assistant director.

Actors

Actors portray the characters in the script. Actors usually audition for a character in the film. During the audition, they read some of the character's lines, or spoken parts, from the script in front of the director and producers. Actors are selected for each of the characters in the script, and they report to the film set on the days that their scenes are being shot.

Each actor is responsible for creating a persona for his or her character, learning and rehearsing the character's lines, and moving as directed in a scene. To best portray a character, an actor may change his or her appearance, mannerisms, or voice. He or she may also need to learn a new skill, such as swordfighting or playing an instrument.

After they have wrapped, or finished their shooting schedule, actors can leave the set.

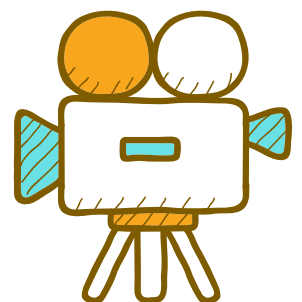


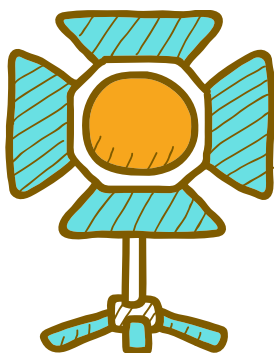
Actors rehearse their lines before shooting begins each day.

However, they may be needed again during postproduction to re-record any dialogue that was not captured properly or was obstructed by other noise.

Skills and training. To perform their roles well, actors need to be creative, speak well, and memorize their lines. And actors must constantly promote themselves, so persistence and patience are crucial.

Many actors have a bachelor's degree in acting, but formal education is not typically required. Acting classes and performance opportunities are often available for all levels at local arts centers, acting schools, and community colleges. These places offer great ways for beginners to improve their acting skills. "Start going to auditions or take a class," says actor Kris Arnold. "It's just like anything else—you get better with practice." Actors learn a lot of their skills on the job, so experience on a set is also important.





Occupations in postproduction

During postproduction, which usually lasts a few months, the production footage is transformed into the completed film. Work during postproduction includes editing the film, adding special effects, and incorporating music and other sound effects.

Occupations involved in postproduction include editors, visual effects artists, sound editors and designers, and composers.

Editors

The editor puts together the film using the footage recorded during production. He or she works closely with the director to determine which take of each scene best reflects what the director wants. Sometimes, a scene may not have gone as planned during shooting, and the editor must adjust the film's story to go with the available footage. "In editing, you find out that certain things may not work out the way you wanted," says editor Anthony Faust. "You have to adapt, and the story must evolve."

As the story evolves, the editor cuts, or edits, the footage so that the scenes fit together smoothly. "Editing should be invisible," Faust says. "You shouldn't feel the cuts." When all the scenes have been edited and combined to the director's satisfaction, the editor creates a final cut of the film to which sound and visual effects are added.

Skills and training. Editors must be creative, organized, and detail oriented to craft a cohesive story from the raw footage. They also need computer skills to use complex editing software. "You don't want a lack of technical skill to get in the way of creative decisions," says Faust.

Editors typically need at least a bachelor's degree in film, broadcasting, or a related field. "A lot of editors have graphic design backgrounds," says Faust. "We are visual people, so it's good to have experience in the visual arts." Some editors gain experience by first working as an assistant editor or in a related occupation.

Visual effects artists

Visual effects artists create the computer-generated imagery or live-action effects, such as explosions or car chases, that many films require.

Visual effects artists produce most of these scenes using computer-generated imagery. A visual effects artist draws a concept sketch for the image, which is approved by the director. From this drawing, the artist makes a three-dimensional model. Using sophisticated graphic design software, the artist re-creates the model on a computer.

After the computer-generated imagery is finished, visual effects artists add the effects to the existing film footage. The images are added into a plate shot, footage that was shot during production with the intention of adding effects later. To add inanimate objects, such as mountains or buildings, artists insert a single image of the object into the plate shot. To add moving objects, such as animals, the artist creates many images of the object in different positions and adds them into the plate shot one by one; when the footage is played back, the object looks as if it is moving.

Skills and training. Visual effects workers need to be creative and must understand color, texture, and light. They also need attention to detail so that they can create realistic-looking effects. And these workers often work in teams, so communication skills and the ability to work well with others are critical.

Visual effects workers typically need a bachelor's degree in computer graphics, art, or a related field. Coursework or work experience in computer programming is useful.

Sound editors and designers

Sound editors and designers create new sounds and edit those recorded on the set—and then add them to the film footage. There can be hundreds of audio tracks in a film, including one for each actor and others for sounds that must be captured during shooting, such as a crackling fire or passing traffic.

Sound editors listen to the recorded dialogue to determine whether the actors need to re-record any lines. They then use audio



Using audio software, sound editors remove unwanted noise from recorded audio tracks.

software to equalize volume and clean up the dialogue tracks by removing unwanted noise.

Sound designers and sound effects editors add in background noises, such as car horns or barking dogs. These are usually taken from a sound library and can be real or produced digitally. If an appropriate sound does not exist in the library, the sound effects editors must create or record it themselves. Workers known as foley artists add in physical sounds that they produce themselves, such as footsteps or thunder.

Throughout the process of adding the sound, sound editors meet with the director to tweak the audio tracks. The approved audio tracks are combined into one “master” track and synchronized with the film footage.

Skills and training. Technical skills and creativity are important for sound editors and designers. “You have to understand the director’s vision and express it artfully and creatively,” says supervising sound editor Kevin Hill.

For sound editors and designers, a high school diploma or equivalent is usually sufficient for entry-level positions, but many of

these workers also have an associate’s degree or vocational certificate. This formal training helps prospective sound designers and editors to understand different types of audio equipment and software.

Training alone is generally not enough for working in film, though. “Some education is useful to learn the fundamentals,” says Hill, “but experience is more important.” To gain experience, some sound editors and designers study at media recording studios. And many postproduction sound workers start out in the music industry.

Composers

Composers create the musical score for a film. Directors work with composers to choose music that creates or complements the film’s mood. The score can be composed and recorded specifically for the film, or it can be adapted from existing music.

For a score original to the film, the composer writes the sheet music. Then, he or she uses a computer program to create the music or hires musicians to perform it for recording. If the film uses existing music, the composer

Composers write music that creates or complements a film's mood.



digitally edits it to complement the film footage.

The composer meets regularly with the director to determine where music best supports the story in each scene. The composer tweaks the music based on the director's feedback. For example, if the director wants a scene to be more dramatic, the composer might speed up the music in that scene.

After finalizing the music, the composer turns over the recordings to the sound editors with a cue sheet. The cue sheet shows precisely where the music should be mixed into the film's master track.

Skills and training. Knowledge of music theory and music software is critical for composers. These workers also must have good interpersonal skills to work with directors and sound editors.

Composers usually need a bachelor's degree in music theory, composition, or conducting. Some composers get experience in a related occupation, sometimes starting out as a musician.

Is a career in film for you?

Working in film production is often stimulating, but the work is not as glamorous as many people believe. As with any job, filmmaking has its rewards and challenges. People interested in starting a career in film should consider both the positive and negative aspects of filmmaking to determine whether the work is right for them.

Rewards

Traveling around the country or the world to research or shoot on location is just one of the perks many filmmakers experience. Some of the other rewards of filmwork include opportunities to be creative, to entertain, and to have fun.

Outlet for creativity. Filmworkers enjoy creating something tangible and often become personally invested in a project. "The realization of my vision is the biggest payoff for me," editor Faust says. "I make the pictures in my head real."

For many filmmakers, working with creative coworkers is another plus. Film production attracts people from all types of backgrounds to collaborate on a single project. "You get to work with people you respect in a fun and fulfilling way," says screenwriting teacher McNevin. Some filmworkers, such as screenwriters and directors, even choose who they work with.

Entertaining others. Filmworkers also enjoy the effect their films have on audiences. For example, a film can make people laugh or cry. But most of all, filmworkers aim to entertain. "Seeing people you don't know genuinely enjoying something you created is an extraordinary feeling," says McNevin.

It's fun. For some, filmmaking almost feels more like play than work. "You get to be a kid," producer-director Merino says. Actor Arnold agrees, adding that the work is freeing and fun.

And workers with technical duties often have access to cutting-edge technology that they wouldn't otherwise get to use.

Challenges

Even when it's fun, however, filmmaking is still work. "The work is tasking, tedious, and often frustrating," says sound editor Hill. Some of the challenges of filmmaking include difficulty earning money, long hours, stress, and competitiveness.

Difficult to earn a living. Finding work and staying employed are often difficult in the film industry. Some workers are unemployed for a long time between projects. "A job in film is never guaranteed," says Faust.

But filmmakers say that wages shouldn't be the motivation for working in these occupations. "Don't do it for the money or the accolades," Merino says. "Do it because you love it." Few filmworkers earn annual salaries; most work hourly or by contract. Wages, many of which are set by unions, are also low for many workers, except for a few at the very top. (See table.)

Long days, erratic hours. Although some filmworkers have flexibility over their schedules, most work long days with unpredictable hours. For example, the cast and crew may shoot a scene on any day and at any time.

Other workers may travel far away to shoot on location, sometimes for weeks at a time.

Waiting times, such as between takes on a set or while computers process footage, contribute to the long days—especially for novices. "The hours are crazy," Hill says. "When I was starting out, I was working around the clock, often until the wee hours of the morning."

Stress. Stress is common for filmworkers, in large part because they typically face inflexible deadlines. Production delays cost money, and there is usually little room in the budget to accommodate extra days of work.

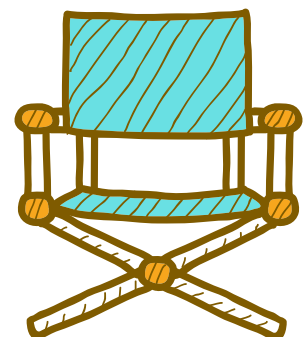
But deadlines must be met—even when the unexpected complicates the schedule. Workers must deal with bad weather, illness, or changes to the script or budget, among other setbacks. "You have to be prepared for everything," says Merino.

And, because a film's investors expect a return on their money, there is a lot pressure to make a financially successful product. For example, producers find it stressful to first secure financing for a film and then to keep it on schedule and within budget. "As a producer, you are always the bad guy," says Merino. "When things go wrong, it's your fault."

Employment and wages for selected occupations in the arts, entertainment, and recreation industry, May 2012

Occupation	Employment	Median hourly wage
Actors	16,640	\$15.88
Audio and video equipment technicians	12,840	20.37
Producers and directors	10,540	29.12
Writers and authors	3,770	28.50
Music directors and composers	2,840	26.07
Set and exhibit designers	2,760	18.69
Multimedia artists and animators	1,390	28.80
Hairdressers, hairstylists, and cosmetologists	670	11.90
Film and video editors	540	30.33
Makeup artists, theatrical and performance	310	23.30

Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics program.





Competitive. The potential for very high earnings and the allure of Hollywood attract a lot of people to the film industry. As a result, many vie for few jobs. “It’s difficult to make any inroads because there are so many people trying to work in the industry,” says McNevin. “Thanks to technology, it has never been easier to get your creative work out there—but it has also never been harder to get someone to pay you for it.”

For many filmworkers, however, the end result makes up for whatever challenges they encounter along the way. “Completing a film is unbelievably rewarding,” Hill says, “and keeps us coming back for more.”

Finding work in film

Getting a job in filmmaking is not easy. Most producers usually seek experienced workers who have been involved in many films. But filmworkers can come from any background. Among the best ways for people to find jobs in filmmaking are through networking and marketing themselves.

Networking

Filmmaking is largely based on reputation and referrals, so who you know is just as important as what you know. “Networking is

important in every industry,” McNevin says, “but none as much as the film industry.”

Formal training. Although expensive and rarely required, film school classes teach the fundamentals of filmmaking and provide hands-on experience. Film school projects are usually unpaid but offer another networking opportunity. “Many of the people who gave me jobs are the same people I went to school with,” McNevin says.

As discussed previously, workers in some filmmaking occupations, such as screenwriters, typically need a degree. But even in occupations that have no degree requirement, such as sound designers, prospective filmworkers benefit from formal training.

Low-budget films. To help develop their network and gain experience, filmworkers often start out in films that are made by small production companies for a niche audience. These positions are often unpaid, but they offer an opportunity to work with people who have made films before. “Be willing to volunteer and find someone to mentor you,” says Merino. “Filmmaking is a craft that should be handed down.”

Marketing yourself

Most filmmakers must be proactive in marketing themselves. “Go to seminars, conventions,

Networking is important in the film production industry, where many workers are self-employed.



and pitchfests to get your work in front of people,” McNevin says.

Location, location, location. An important factor when looking for filmwork is location. Film jobs are concentrated in a handful of major metropolitan areas, such as Los Angeles, New York, and Seattle. Prospective workers have the best odds of finding work by moving to cities that have well-established filmmaking communities.

Make a film. Some filmworkers gain experience by making their own films. This allows aspiring filmmakers to try out many different jobs while working through the entire filmmaking process. “Think about what you want to say, and make the film yourself—even if it’s a minute long,” says Faust. Arnold adds, “Don’t worry about the results but about the experience.”

Persistence. Regardless of where you go or what you work on, however, little changes when it comes to getting a job in film. “You’re constantly interviewing for work,” says Arnold. “The amount of time you spend working is miniscule compared to the time you spend networking and marketing yourself.”

Perseverance is necessary for nearly everyone who wants to work in the film industry. “You’ll fail a lot,” says McNevin, “but it only takes one yes to start a career.”

For more information

Film production is a lengthy process that involves many different workers. This article describes the major occupations in filmmaking. The *Occupational Outlook Handbook (OOH)* has detailed profiles on many of these occupations. These profiles have information about each occupation’s job duties, wages, employment outlook, education and training, and more. The *OOH* is available online at www.bls.gov/ooh.

The *Occupational Outlook Quarterly* has published articles about other film occupations. To learn more about composers in filmmaking, see “My Career: Composer” in the spring 2013 issue, available at www.bls.gov/ooq/2013/spring/mycareer.pdf. And to learn

more about foley artists, see “You’re a *what?* Foley artist” in the spring 2011 issue at www.bls.gov/ooq/2011/spring/yawhat.htm.

Information about occupations in the film industry is available from professional associations.

For information about screenwriters, including a variety of writing resources and tools, contact:

Writers Guild of America, West
7000 W. Third St.
Los Angeles, CA 90048
(323) 951-4000
www.wga.org

For information about directors, contact:
Directors Guild of America
7920 Sunset Blvd.
Los Angeles, CA 90046
Toll-free: 1 (800) 421-4173
www.dga.org

For information about cinematography workers, including camera operators and still photographers, contact:

International Cinematographers Guild
7755 Sunset Blvd.
Hollywood, CA 90046
(323) 876-0160
www.cameraguild.com

For information about actors, contact:
SAG-AFTRA
5757 Wilshire Blvd., 7th Floor
Los Angeles, CA 90036
Toll-free: 1 (855) SAG-AFTRA
(724-2387)
www.sagaftra.org

For information about many postproduction workers, such as editors and foley artists, contact:

Motion Picture Editors Guild
7715 Sunset Blvd., Suite 200
Hollywood, CA 90046
Toll-free: 1 (800) 705-8700
mail@editorsguild.com
www.editorsguild.com





Financial info for students

The federal government's Consumer Financial Protection Bureau offers a wealth of financial information online—and much of it is for students.

For example, the Paying for College page has links to reliable websites for researching schools, managing money, and repaying student loans. Students can also compare financial aid options and different types of loans.

Another feature on the website is a student loan repayment assistant. Students answer a few questions about their loans, and the assistant describes several repayment options and provides links to more information about those options. There are also repayment calendars to help students plan their payment schedule.

Visit the bureau's Paying for College site at www.consumerfinance.gov/paying-for-college. To use the repayment assistant, see www.consumerfinance.gov/students/repay.

And to learn more about paying for college and dealing with student loan debt, see "Paying for College: Strategies to afford higher education" in the spring 2013 issue of the *Quarterly*, online at www.bls.gov/ooq/2013/spring/art01.pdf.



OOH and My Next Move, now en español

¿Habla español? Two career resources from the U.S. Department of Labor—the *Occupational Outlook Handbook* (OOH) and the My Next Move website—are now available online in Spanish.

The *OOH en español*, published by the U.S. Bureau of Labor Statistics (BLS), includes 341 occupation profiles, an overview of the 2010–20 employment projections, and more. Each occupation profile discusses what workers in that occupation do, their work environment, the typical education and training needed to enter the occupation, pay, and job outlook. The Spanish-language version of the *OOH* is online at www.bls.gov/es/oooh.

Mi Próximo Paso, created by the National Center for O*NET Development, is the Spanish-language version of My Next Move website. The site allows users to search hundreds of careers by keyword, browse careers by industry, or get career suggestions based on their interests. Career pages offer information about the educational requirements and skills necessary for each career as well as links to related education or certification websites. Visit Mi Próximo Paso at www.miproximopaso.org.

Simplifying the job search

For some jobseekers, the number of job-search websites can be overwhelming. The website US.jobs makes it easier to look for a job by gathering hundreds of state and local job listings in one place. Jobseekers can search the listings by keyword and location.

But US.jobs, created by the National Labor Exchange, has more than job listings. Other resources for jobseekers include resume writing guidance and a directory of links to educational information. A job-search page for veterans provides links to career-building and relocation resources for men and women transitioning out of military service.

US.jobs also has a list of job fairs and other career events around the country, searchable by date and location. There's information for employers who wish to post jobs, too.

For access to all of these resources, visit www.us.jobs.

Engineering scholarships for women

Women made up less than 14 percent of architecture and engineering occupations in 2012, according to the BLS Current Population Survey. To encourage more women to enter these fields, the Society of Women Engineers offers scholarships for women to study engineering, computer science, or technology at the bachelor's or graduate degree level. Last year, it awarded nearly 200 scholarships worth a total of more than \$500,000.

The society's website has a searchable database of available scholarships that can be filtered by keyword and academic year (freshman, sophomore, and so forth). The database shows how many of each scholarship are available, for what amounts, and what the eligibility requirements are. Students may apply for scholarships directly online.

For women interested in a career in engineering or a related field, there is a lot of other information on the society's website. To browse its scholarships and other resources online, visit societyofwomenengineers.swe.org/index.php/scholarships.



Self-employment help: Search for government grants

Looking to start a small business of your own? Or to expand and invest in one you already have? The federal government offers grant money for these types of projects.

Grants.gov, a website managed by the U.S. Department of Health and Human Services, provides an easy way to search for grant opportunities. The site is a one-stop shop that allows users to find and apply for federal grants. It also has information about what types of grants are available and lists new types of opportunities that have been posted.

Users can apply for grants and track their applications directly online. Other resources for applicants include registration checklists and a guide to applying for grants.

To begin a search, visit www.grants.gov.

But with or without the help of a grant, many people start a business to turn their ideas into reality. To read about one such small-business owner who sells her own creations to people all over the world, see "You're a what? Online seller" in the spring 2013 issue of the *Quarterly*, online at www.bls.gov/ooq/2013/spring/yawhat.htm.



College to career:

Projected job openings in occupations that typically require a bachelor's degree



Which occupations are expected to have the most jobs for college graduates? U.S. Bureau of Labor Statistics (BLS) employment projections shed light on occupations likely to have many opportunities for jobseekers who have a degree.

BLS has classified more than 150 occupations that typically require a bachelor's degree for entry. Between 2010 and 2020, these occupations are projected to have more than 8.5 million job openings. Occupations related to three groups—business, education, and computer science—account for many of these jobs.

Keep reading to learn more about prospects for moving from college to career. The first section describes unemployment and earnings by college major. The second section talks about projected job openings in occupations that typically require a bachelor's degree. The third section explains how to use this information to plan a career. And the final section gives sources for exploring further.

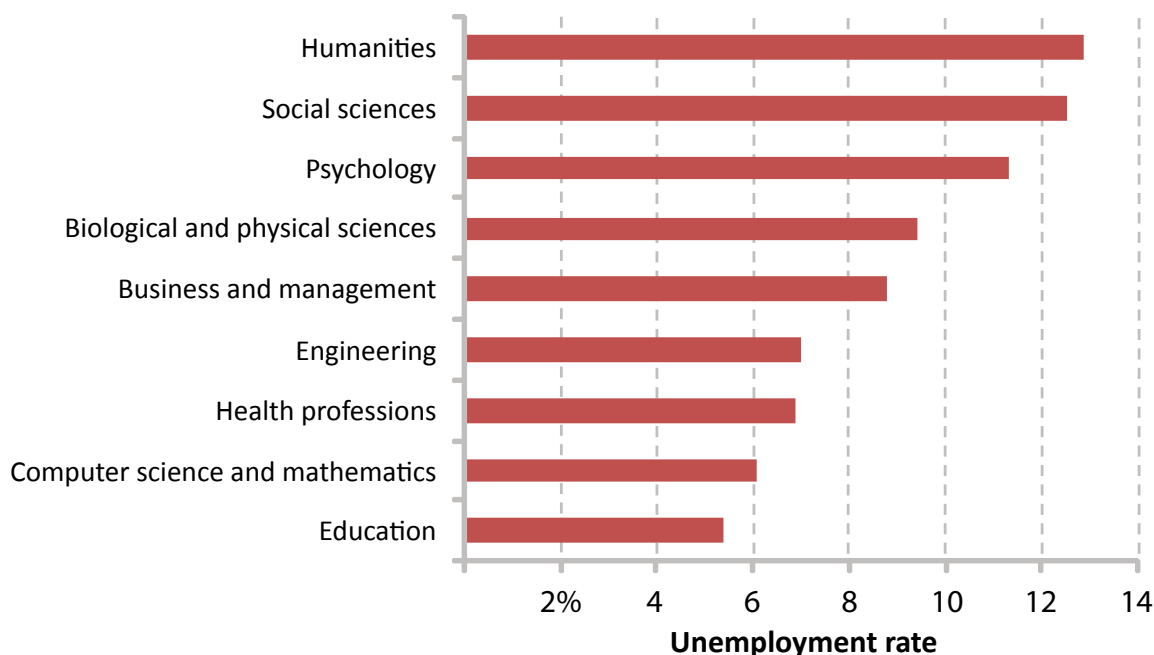
Unemployment and earnings by college major

People with a bachelor's degree have a lower unemployment rate and earn more money than people who have less education, BLS data show. But your choice of college major can influence your employment options and earnings—and, sometimes, your ability to get a job.

Unemployment rates of recent college graduates vary by field, National Center for Education Statistics data from 2009 show. (See chart.) One year after graduation, 2007–08 bachelor's degree recipients in business, the most popular field of study, had an unemployment rate of about 9 percent. And unemployment among humanities and social science majors was almost 13 percent, more than twice the rate of their counterparts who majored in education or computer science and mathematics.

Table 1 on page 34 shows that earnings differ significantly by field. According to the

Unemployment rates of 2007–08 graduates in 2009, one year after earning a bachelor's degree, by selected field of major



Elka Torpey

Elka Torpey is an economist in the Office of Occupational Statistics and Employment Projections, BLS. She is available at torpey.elka@bls.gov.

Source: National Center for Education Statistics, Digest of Education Statistics, Table 403.

National Association of Colleges and Employers, class of 2012 engineering graduates had the highest average annual starting salaries, at \$62,655. Humanities and social sciences graduates had average annual starting salaries that were more than \$25,000 less than that.

To enter some occupations, you typically need a bachelor's degree in a specific field. Engineers, for example, usually need a degree in engineering. For others, employers may be willing to hire people from a variety

of college majors. But having taken courses related to your occupations of interest is often helpful when looking for jobs.

Projected job openings in bachelor's degree occupations

How can you identify which occupations that typically require a bachelor's degree are projected to have many job openings in the future? BLS classifies occupations into several education and training categories. Each occupation is assigned to the education, on-the-job training, and work experience categories that best describe a typical path for workers who want to enter the occupation.

Tables and accompanying text below give information about more than 100 bachelor's degree occupations. Occupations are grouped into eight career fields.

What the tables show

Each table shows projected job openings, wages, and on-the-job training and work experience requirements that jobseekers typically need to enter a bachelor's degree-level occupation.

Table 1: Average starting salaries of Class of 2012 graduates, by field of major

Field of major	Average starting salary
Engineering	\$62,655
Computer science	59,221
Business	53,900
Health sciences	49,196
Communications	43,717
Math and sciences	42,471
Education	40,668
Humanities and social sciences	36,988

Source: National Association of Colleges and Employers, January 2013 Salary Survey.

While in college, you may find it useful to take courses related to occupations that interest you.



Job openings. BLS economists project the number of job openings in an occupation by estimating the jobs expected to be available over 10 years, the most recent being between 2010 and 2020. The estimates reflect the total number of job openings expected in an occupation over the decade.

Projected openings include all jobs expected to be available in the occupation, stemming from both the need to replace workers who leave an occupation permanently and the creation of new jobs.

Wages. The wage data in the tables are median annual wages for May 2012. A median wage means that half of the workers in an occupation earned more than that amount, and half earned less. Recent college graduates and other entry-level workers should expect to earn less than the median wage.

Whether an occupation is considered to have a high or low wage depends on how it compares with the May 2012 median annual wage of \$34,750 for all wage and salary workers. Nearly all of the occupations in the tables had wages that were higher than the median.

On-the-job training. This column in the tables shows on-the-job training typically needed before workers attain competency in an occupation. The training is occupation-specific, not job-specific, meaning that the skills learned can be transferred to another job in the same occupation. And it includes technical training that workers receive after being hired.

Short-term on-the-job training lasts 1 month or less, moderate-term on-the-job training lasts between 1 and 12 months, and long-term on-the-job training lasts more than a year. Required internships or residencies, which generally involve supervised training in a professional setting, are also included in the category of on-the-job training.

Work experience. To enter some occupations, prospective workers first must have held a job in a related occupation. For example, art directors typically must have worked as a graphic designer, copy editor, or similar occupation before being eligible for entry-level art director jobs. Occupations that typically



Some occupations, such as art director, typically require work experience along with a college degree.

need work experience, as classified by BLS, are highlighted in the tables.

Most jobseekers benefit from having work experience. However, the occupations highlighted in the tables are those in which employers commonly consider it necessary for applicants to have experience in a related occupation.

Occupation groups

The occupations that typically require a bachelor's degree are grouped into eight career fields. These fields are discussed in order of most projected job openings to least projected job openings for the occupations in each:

- Business, financial operations, and sales
- Education, training, and library
- Computer science and math
- Arts, media, and related
- Architecture and engineering
- Healthcare and community and social service
- Life, physical, and social science, and
- Other

Some of these career fields are associated with specific college majors. A marketing major, for example, might consider occupations in business, financial operations, or sales. An English major might be interested

Table 2: Business, financial operations, and sales bachelor's-level occupations

Occupation	Projected job openings, 2010–20	Median annual wage, 2012	On-the job training	Work experience
Accountants and auditors	452,100	\$63,550	None	None
Management analysts	274,300	78,600	None	1 to 5 years
Market research analysts and marketing specialists	191,800	60,300	None	None
Sales representatives, wholesale and manufacturing, technical and scientific products	159,700	74,970	Moderate-term	None
Securities, commodities, and financial services sales agents	133,700	71,720	Moderate-term	None
Financial analysts	104,200	76,950	None	None
Cost estimators	103,000	58,860	None	None
Training and development specialists	98,300	55,930	None	None
Personal financial advisors	90,200	67,520	None	None
Compliance officers	58,600	62,020	Moderate-term	None
Logisticians	48,700	72,780	None	1 to 5 years
Meeting, convention, and event planners	45,000	45,810	None	Less than 1 year
Insurance underwriters	39,100	62,870	Moderate-term	None
Sales engineers	32,100	91,830	Moderate-term	None
Credit analysts	25,900	61,080	None	None
Compensation, benefits, and job analysis specialists	24,000	59,090	None	None
Tax examiners and collectors, and revenue agents	23,000	50,440	Moderate-term	None
Budget analysts	19,600	69,280	None	None
Credit counselors	15,200	39,420	Moderate-term	None
Financial examiners	14,100	75,800	Moderate-term	None
Agents and business managers of artists, performers, and athletes	8,000	63,370	None	1 to 5 years

Source: U.S. Bureau of Labor Statistics (job openings, Employment Projections program; median annual wages, Occupational Employment Statistics program).

in arts, media, and related occupations. And a social work major might find a good fit with healthcare or community and social service occupations.

These groupings by career field are based roughly on the occupation groups used in the *Occupational Outlook Handbook (OOH)*. Management occupations are discussed separately in a box on page 44.

Business, financial operations, and sales. Between 2010 and 2020, BLS projects about 2 million job openings in the occupations shown in table 2.

People in business, financial operations, and sales occupations usually like working with numbers or people or both. They have good organizational and analytical skills, which they use in decisionmaking and planning. And they are often detail oriented.

Of the occupations in the table, accountants and auditors and management analysts are projected to have the most job openings between 2010 and 2020. For business, financial operations, and sales occupations, the median annual wages in 2012 ranged from \$39,420 for credit counselors to \$91,830 for sales engineers.

In many of these occupations, college graduates typically can qualify for—and be competent in—entry-level jobs with a bachelor's degree and no additional on-the-job training or work experience. Examples are financial analysts, cost estimators, and training and development specialists.

But in other occupations shown in the table, graduates usually need additional training or experience. Sales representatives, for example, often need moderate-term on-the-job training to become competent in the occupation. And meeting, convention, and event planners often need some hotel or planning experience.

Education, training, and library.

About 1.5 million job openings are projected between 2010 and 2020 in the occupations shown in table 3, according to BLS.

Workers in these occupations usually enjoy interacting with people. Most have good communication and instructional skills. Patience, critical thinking ability, and creativity are also important for some jobs.

Elementary and secondary school teachers are the occupations in the table projected to have the most job openings between 2010 and 2020. (Both totals exclude special education teachers, and secondary school teachers also does not include career or technical education teachers.) Median annual wages in May 2012 ranged from \$38,220 for museum technicians and conservators to \$56,830 for secondary school special education teachers.

Public school teachers must be licensed by the state in which they work. Licensure requirements vary, but supervised teaching experience (classified by BLS as an

Table 3: Education, training, and library bachelor's-level occupations

Occupation	Projected job openings, 2010-20	Median annual wage, 2012	On-the-job training	Work experience
Elementary school teachers, except special education	573,200	\$53,400	Internship/residency	None
Secondary school teachers, except special and career/technical education	355,600	55,050	Internship/residency	None
Middle school teachers, except special and career/technical education	249,300	53,430	Internship/residency	None
Special education teachers, preschool, kindergarten, and elementary school	113,300	52,480 (preschool) and 53,820 (kindergarten and elementary school)	Internship/residency	None
Kindergarten teachers, except special education	79,300	50,120	Internship/residency	None
Special education teachers, secondary school	51,100	56,830	Internship/residency	None
Special education teachers, middle school	48,800	55,780	Internship/residency	None
Adult basic and secondary education and literacy teachers and instructors	26,000	48,590	Internship/residency	None
Career/technical education teachers, secondary school	25,200	55,160	Internship/residency	1 to 5 years
Career/technical education teachers, middle school	4,500	54,220	Internship/residency	1 to 5 years
Museum technicians and conservators	4,100	38,220	None	None
Audio-visual and multimedia collections specialists	2,900	43,350	None	1 to 5 years
Archivists	2,400	47,340	None	None

Source: U.S. Bureau of Labor Statistics (job openings, Employment Projections program; median annual wages, Occupational Employment Statistics program).

internship/residency) is usually required. Prospective teachers often complete this requirement, commonly known as student teaching, while earning a degree.

In some education, training, and library occupations, entry-level workers typically need experience in a related occupation. Career and technical education teachers, for example, typically need 1 to 5 years of experience in the field in which they teach, so many of these teachers have had careers in business, computer science, or engineering.

Workers in computer science occupations usually like analyzing and solving problems.



Computer science and math. BLS projects the occupations in table 4 to have about 1.1 million job openings between 2010 and 2020. Most of the occupations in the table are related to computer and information technology.

People well suited for computer science and math occupations usually like analyzing and solving problems. Most have good technical ability and a strong grasp of mathematics. They also usually are detail oriented. Communication skills are important for some jobs in this group.

Between 2010 and 2020, computer systems analysts and applications software developers are projected to have the most job openings of the occupations in the table. In May 2012, median annual wages for occupations in this group ranged from \$62,500 for Web developers to \$99,000 for systems software developers.

Only one of the occupations in this table typically requires on-the-job training: actuaries. These workers must pass a series of exams to become fully competent in the occupation; many people take these exams while working as trainees in the occupation. BLS classifies this preparation as long-term on-the-job training.

Table 4: Computer science and math bachelor's-level occupations

Occupation	Projected job openings, 2010-20	Median annual wage, 2012	On-the-job training	Work experience
Computer systems analysts	222,500	79,680	None	None
Software developers, applications	197,900	90,060	None	None
Software developers, systems software	168,000	99,000	None	None
Network and computer systems administrators	155,300	72,560	None	None
Computer programmers	128,000	74,280	None	None
Information security analysts, Web developers, and computer network architects	110,300	86,170, 62,500, and 91,000	None	1 to 5 years
Database administrators	52,700	77,080	None	1 to 5 years
Operations research analysts	30,000	72,100	None	None
Actuaries	18,900	93,680	Long-term	None

Source: U.S. Bureau of Labor Statistics (job openings, Employment Projections program; median annual wages, Occupational Employment Statistics program).

For several of the occupations in the table, prospective workers usually need experience to get an entry-level job. Database administrators, for example, typically have 1 to 5 years of experience in a related occupation such as financial analyst, market research analyst, or operations research analyst. And computer network architects usually have at least 5 to 10 years of experience working in network administration or a similar field.

Arts, media, and related. BLS projects about 623,000 job openings between 2010 and 2020 in the occupations shown in table 5. This group includes arts, design, entertainment, sports, and media occupations.

Workers in these occupations are generally creative and enjoy interacting with people or developing ideas. Jobs may require artistic or musical ability. Good communication skills are important for some occupations in this

group. Others jobs typically need technical or computer skills.

People interested in arts, media, and related occupations often forge their own career path by working for themselves. Writers and authors, music directors and composers, and interior designers are among the occupations with a high percentage of self-employed workers, according to BLS.

Of the occupations in the table, graphic designers and public relations specialists are projected to have the most job openings between 2010 and 2020. In May 2012, median annual wages for the occupations in this group ranged from \$28,020 for radio and television announcers to \$80,880 for art directors.

On-the-job training is important for some of the occupations in the table, including writers and authors, interpreters and translators, and multimedia artists and animators.

Table 5: Arts, media, and related bachelor's-level occupations

Occupation	Projected job openings, 2010-20	Median annual wage, 2012	On-the-job training	Work experience
Public relations specialists	127,200	\$54,170	Moderate-term	None
Graphic designers	123,800	44,150	None	None
Producers and directors	49,700	71,350	None	1 to 5 years
Writers and authors	47,600	55,940	Long-term	None
Interpreters and translators	40,300	45,430	Long-term	None
Editors	37,000	53,880	None	1 to 5 years
Music directors and composers	32,200	47,350	None	1 to 5 years
Interior designers	28,400	47,600	None	None
Art directors	24,300	80,880	None	1 to 5 years
Multimedia artists and animators	21,400	61,370	Moderate-term	None
Reporters and correspondents	18,400	35,870	None	None
Technical writers	18,300	65,500	Short-term	1 to 5 years
Radio and television announcers	17,200	28,020	None	None
Commercial and industrial designers	16,900	59,610	None	None
Film and video editors	7,300	51,300	None	1 to 5 years
Camera operators, television, video, and motion picture	5,400	40,300	Moderate-term	None
Set and exhibit designers	4,800	50,300	None	None
Broadcast news analysts	3,000	55,380	None	None

Source: U.S. Bureau of Labor Statistics (job openings, Employment Projections program; median annual wages, Occupational Employment Statistics program).

Table 6: Architecture and engineering bachelor's-level occupations

Occupation	Projected job openings, 2010-20	Median annual wage, 2012	On-the-job training	Work experience
Civil engineers	104,400	79,340	None	None
Mechanical engineers	99,600	80,580	None	None
Industrial engineers	57,500	78,860	None	None
Architects, except landscape and naval	50,900	73,090	Internship/residency	None
Electrical engineers	47,800	87,920	None	None
Electronics engineers, except computer	40,600	91,820	None	None
Surveyors	24,200	56,230	None	None
Computer hardware engineers	22,900	100,920	None	None
Environmental engineers	22,600	80,890	None	None
Aerospace engineers	21,800	103,720	None	None
Biomedical engineers	13,100	86,960	None	None
Petroleum engineers	11,800	130,280	None	None
Chemical engineers	11,400	94,350	None	None
Health and safety engineers, except mining safety engineers and inspectors	8,200	76,830	None	None
Materials engineers	8,100	85,150	None	None
Landscape architects	7,800	64,180	Internship/residency	None
Nuclear engineers	6,200	104,270	None	None
Cartographers and photogrammetrists	6,100	57,440	None	None
Marine engineers and naval architects	2,300	88,100	None	None
Mining and geological engineers, including mining safety engineers	2,000	84,320	None	None
Agricultural engineers	800	74,000	None	None

Source: U.S. Bureau of Labor Statistics (job openings, Employment Projections program; median annual wages, Occupational Employment Statistics program).

For example, an entry-level public relations specialist might learn on the job by helping experienced staff members assemble information for speeches, news releases, or articles. These specialists may work in this role for 1 to 12 months before being assigned to write the products independently.

Some occupations typically require 1 to 5 years of experience in a related occupation in addition to a bachelor's degree. Producers, for example, might have experience as a business manager, assistant producer, or director.

Architecture and engineering. From 2010 to 2020, about 570,000 job openings are projected in the occupations shown in table 6. Most of these are engineering occupations.

People who pursue these occupations usually like math, analysis, and problem-solving. Communication, project management, creative, and technical skills are also valued in some engineering or architecture occupations. Mechanical ability and visualization skills may be required too.

Of the occupations in the table, BLS projects civil and mechanical engineers to have the most job openings between 2010 and 2020. In May 2012, median annual wages for the occupations in this group ranged from \$56,230 for surveyors to \$130,280 for petroleum engineers.

Prospective architects usually must have at least 3 years of training before they are

eligible to take the licensing exam that is required to work in the occupation. Most people meet this training requirement through an internship at an architectural firm after earning their degree, although college internships may also count toward the required time.

Some engineers, such as those who sell their services directly to the public, need a license. However, people don't typically need on-the-job training or work experience to be competent in, or to get entry-level jobs in, engineering occupations.

Healthcare and community and social service. The occupations in table 7 are projected to have about 533,000 job openings between 2010 and 2020.

People who do these jobs usually enjoy helping others. They need good communication and interpersonal skills. And some jobs require workers to have attributes such as critical thinking, problem-solving, or decision-making ability.

Child, family, and school social workers and clergy are the occupations in the table that BLS projects to have the most job openings from 2010 to 2020. In May 2012, median annual wages for the occupations in this table



Most healthcare and community and social service workers enjoy helping others.

Table 7: Healthcare and community and social service bachelor's-level occupations

Occupation	Projected job openings, 2010-20	Median annual wage, 2012	On-the-job training	Work experience
Child, family, and school social workers	128,300	41,530	None	None
Clergy	79,900	44,060	Moderate-term	None
Mental health and substance abuse social workers	69,400	39,980	None	None
Medical and clinical laboratory technologists	52,100	57,580	None	None
Directors, religious activities and education	44,500	37,280	None	1 to 5 years
Probation officers and correctional treatment specialists	37,300	48,190	Short-term	None
Health educators	36,900	48,790	None	None
Dietitians and nutritionists	35,400	55,240	Internship/residency	None
Occupational health and safety specialists	25,700	66,790	Moderate-term	None
Recreational therapists	11,900	42,280	None	None
Athletic trainers	11,900	42,090	None	None

Source: U.S. Bureau of Labor Statistics (job openings, Employment Projections program; median annual wages, Occupational Employment Statistics program).

ranged from \$37,280 for religious activities and education directors to \$66,790 for occupational health and safety specialists.

On-the-job training is typically required in several of the occupations in the table. Probation officers and correctional treatment specialists, for example, often must complete a training program offered by their state government or the federal government and then pass a certification test. Dietitians and nutritionists typically need to complete an internship, which involves several hundred hours of supervised training; many states also require that these workers are licensed.

The only occupation in the table that usually requires experience is religious activities and education director. People in this occupation typically have worked 1 to 5 years in a related occupation, such as teacher.

Life, physical, and social science. About 193,000 job openings are projected for the occupations in table 8 between 2010 and 2020.

Most of these projected job openings are in the life and physical sciences.

People in these occupations usually like researching and solving problems. They need good critical-thinking ability. Communication skills, the ability to work well as part of a team, and an aptitude for math or technical subjects are also helpful.

Of the occupations in the table, BLS projects environmental scientists and specialists, including health scientists, and biological technicians to have the most job openings between 2010 and 2020. Wages for the occupations in the table ranged from \$39,750 for biological technicians to \$91,860 for economists in May 2012.

A bachelor's degree is usually enough preparation for entry-level jobs in these occupations. An exception is forensic science technicians, who typically also need moderate-term on-the-job training.

Table 8: Life, physical, and social science bachelor's-level occupations

Occupation	Projected job openings, 2010-20	Median annual wage, 2012	On-the-job training	Work experience
Environmental scientists and specialists, including health	43,200	63,570	None	None
Biological technicians	37,900	39,750	None	None
Chemists	29,900	71,770	None	None
Geoscientists, except hydrologists and geographers	17,100	90,890	None	None
Survey researchers	9,900	45,050	None	None
Soil and plant scientists	8,600	58,740	None	None
Forensic science technicians	7,900	52,840	Moderate-term	None
Microbiologists	7,200	66,260	None	None
Food scientists and technologists	6,800	58,070	None	None
Zoologists and wildlife biologists	5,900	57,710	None	None
Economists	5,800	91,860	None	None
Conservation scientists	4,000	61,100	None	None
Materials scientists	3,700	88,990	None	None
Atmospheric and space scientists	2,100	89,260	None	None
Foresters	1,900	55,950	None	None
Geographers	1,300	74,760	None	None

Source: U.S. Bureau of Labor Statistics (job openings, Employment Projections program; median annual wages, Occupational Employment Statistics program).

Other occupations. BLS projects about 197,000 job openings between 2010 and 2020 in the occupations shown in table 9. These diverse occupations include workers from farming, fishing, and forestry; legal, office and administrative support; personal care and service; and transportation occupation groups.

Necessary skills for these workers vary. Attention to detail is important for proofreaders, for example, but ship engineers need mechanical ability.

Of the occupations in the table, recreation workers and airline pilots, copilots, and flight engineers are projected to have the most job openings between 2010 and 2020. In May 2012, median annual wages for the occupations in the tables ranged from \$22,240 for recreation workers to \$114,200 for airline pilots, copilots, and flight engineers.

More than half of the occupations in the table typically require moderate-term on-the-job training. Some of these occupations also may require experience in a related occupation.

Airline pilots, for example, typically receive 6 to 8 weeks of ground school training and additional flight time from their employers after being hired. In addition, all pilots who are paid to transport passengers or cargo need a commercial pilot's license



Airline pilots have high wages but also need work experience and on-the-job training.

Table 9: Other bachelor's-level occupations

Occupation	Projected job openings, 2010-20	Median annual wage, 2012	On-the-job training	Work experience
Recreation workers	118,600	\$22,240	None	None
Airline pilots, copilots, and flight engineers	31,300	114,200	Moderate-term	1 to 5 years
Captains, mates, and pilots of water vessels	20,700	66,150	None	None
Ship engineers	6,200	70,890	None	None
Agricultural inspectors	6,000	42,160	Moderate-term	None
Statistical assistants	4,100	39,840	None	None
Administrative law judges, adjudicators, and hearing officers	3,700	87,240	Moderate-term	1 to 5 years
Proofreaders and copy markers	3,300	32,780	Moderate-term	None
Arbitrators, mediators, and conciliators	3,200	61,280	Moderate-term	1 to 5 years

Source: U.S. Bureau of Labor Statistics (job openings, Employment Projections program; median annual wages, Occupational Employment Statistics program).

and an instrument rating. These workers also typically need flight experience, such as that gained by flying planes in the military or having worked as a commercial pilot.

How to use this information in career planning

There are many things to consider when choosing a career. In addition to data—such

as unemployment rates and projections of job openings—you should also take into account your interests and abilities, what workers in an occupation do, and more.

The projections data in this article provide information about future job openings. But for most occupations, many factors influence the job market and a college graduate's ability to get a job in it. If you complete an internship while in school, for example, you may have an advantage over jobseekers who did not.

Also keep in mind that people with a bachelor's degree can work in occupations

Management occupations that typically require a bachelor's degree

Management occupations are often high paying—and most require a degree. But to become a manager, you'll probably need experience, too. In fact, of the management occupations that BLS classifies as typically needing a bachelor's degree, only medical and health services managers qualify for entry-level jobs without experience.

Between 2010 and 2020, BLS projects over 1 million job openings in management occupations that typically require a bachelor's degree. Of these, 15 occupations had median annual wages of more than \$80,000.

Managers usually like working with people and directing activities. Most need strong communication and interpersonal skills. Expertise related to the tasks that managers oversee is also important. For example, human resources managers usually have experience working with compensation and benefits plans, training and development, labor relations, or recruitment.

One to 5 years of experience

The following management occupations typically require that workers have 1 to 5 years of related experience. Of these occupations, only emergency management directors usually require on-the-job training in addition to experience.

- Advertising and promotions managers
- Compensation and benefits managers
- Emergency management directors
- Human resources managers
- Industrial production managers
- Legislators
- Marketing managers
- Preschool and childcare center or program education administrators
- Public relations and fundraising managers
- Sales managers
- Social and community service managers
- Training and development managers

More than 5 years of experience

In these management occupations, workers typically need more than 5 years of related experience:

- Architectural and engineering managers
- Chief executives
- Computer and information systems managers
- Financial managers
- Natural sciences managers
- Purchasing managers

other than those shown here. This analysis looks only at occupations that BLS classifies as typically requiring a bachelor's degree for entry. Other occupations aren't discussed because they are classified as typically needing another level of education, such as an associate's or doctoral degree.

BLS assigns occupations to education and training categories based on what economists in the Occupational Employment Projections program determine is a typical path for people to take to enter an occupation. However, many occupations have multiple paths to entry.

For example, registered nurses often have a bachelor's degree, and BLS projects more than 700,000 job openings between 2010 and 2020 for registered nurses. But BLS classifies this occupation as typically requiring an associate's degree, because analysts have determined an associate's degree to be the minimal requirement for entry-level jobs. After they are hired, many registered nurses complete additional levels of education. Jobseekers with a bachelor's degree may apply for entry-level jobs, even if applicants do not typically need more than an associate's degree, and some employers may prefer to hire candidates who have more education than what is typical.

Before choosing a college major or thinking about a career, learn about occupations that interest you and identify the types of education and training commonly required. Talking to a career counselor and researching occupations are also helpful.

For more information

The *Occupational Outlook Handbook (OOH)* is published by BLS and has lots of information about careers. Search hundreds of occupations based on entry-level education, projected number of jobs, wages, and more at www.bls.gov/ooh.

Find the latest employment and wage data from the BLS Occupational Employment Statistics program at www.bls.gov/oes.

The education and training page on the BLS employment projections website, www.bls.gov/emp/



[ep_education_training_system.htm](http://www.bls.gov/ep_education_training_system.htm), has detailed information about the education and training categories presented in this article.

The *Occupational Outlook Quarterly* also has several articles related to education and training:

- “Paying for college: Strategies to afford higher education today,” in the spring 2013 issue, online at www.bls.gov/ooq/2013/spring/art01.pdf
- “Certificates: A fast track to careers,” in the winter 2012–13 issue, online at www.bls.gov/ooq/2012/winter/art01.pdf
- “High wages after high school—without a bachelor's degree,” in the summer 2012 issue, online at www.bls.gov/ooq/2012/summer/art03.pdf
- “Paving the occupational path: A new system for assigning education and training,” in the fall 2011 issue, online at www.bls.gov/ooq/2011/fall/art02.pdf

Older *Quarterly* articles explore options for business and liberal arts majors. You can find those and other college-related articles in the online index at www.bls.gov/ooq/ooqindex.htm.

State employment projections can help you to gauge an occupation's prospects near where you live. Access this information from www.projectionscentral.com.



You're a *what?*

Ornithologist

Kathleen
Green

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When ornithologist Amanda Rodewald talks about tweets and angry birds, she's not usually referring to social media and video games. She's probably discussing science.

"Birds have calls that they use when they're agitated or to alarm others of danger," says Amanda. "In fact, there's been research showing that chickadee calls can actually communicate the size and type of a predator."

Ornithology is the branch of zoology related to birds. Some ornithologists study birds to find clues about how to protect the environment. For example, Amanda's research focuses on the ways that human activity affects birds and their ecosystems, and her findings are useful for conservation and land management efforts.



What they do

Ornithologists work in academia, federal and state agencies, wildlife and conservation organizations, and other institutions, such as the World Bank. They study birds in their natural habitats or in the laboratory. They also may write research reports and proposals for grants, teach classes, present research to the public, and have administrative duties related to these activities. Some ornithologists, like Amanda, do all these tasks.

Research and writing. Many questions about ornithology are best answered by observing birds in the wild during fieldwork. Amanda and her students have done fieldwork in locations as remote as the Andes Mountains in South America and as nearby as the forests of southern Ohio and the Midwest.

Fieldwork usually involves surveying, or counting, birds and monitoring their nests. “Fieldwork is where many ornithologists learn how to collect data for research,” says Amanda. “For example, we’ll watch and record different species foraging to discover where and what they eat.” During fieldwork, ornithologists might also attach metal or plastic bands to a bird’s leg to help identify individual birds and aid with survival estimates.

But not all ornithologists work outdoors. Much of the research that ornithologists do is in the lab. For example, feathers collected during fieldwork are analyzed in the lab for a variety of purposes, including genetic mapping. And some studies of migratory behavior or mate choice might involve observing birds in special cages.

Ornithologists often write reports about their research or publish articles in scientific journals focused on biology, ecology, conservation, or wildlife management. And ornithologists who do research also write grant proposals to seek funding for specific research.

Teaching and outreach. In addition to educating people through writing about birds, ornithologists share their knowledge by teaching college courses. For example, Amanda will teach a course on conservation

biology for Cornell University’s Department of Natural Resources.

But education is not limited to teaching college students. Outreach activities might include giving talks and making presentations to natural resources managers of government and other nonprofit organizations as well as to people in public interest groups, birdwatching clubs, and schools.

Administration. An ornithologist’s administrative tasks vary, depending on the job. Most of Amanda’s administrative duties are related to her work as director of conservation science at the Cornell Lab of Ornithology in Ithaca, New York. Her responsibilities include program oversight and supervision, budgeting, and strategic planning.

How they prepare

Ornithologists need an advanced degree for most jobs. But at every level of ornithology work, says Amanda, academic credentials alone aren’t enough. “Education is important,” she says, “but practical experience in the field or lab is critical.”

Education. Ornithologists may start out with a bachelor’s degree in wildlife biology, ecology, or some other life science. Students also benefit from coursework in math and statistics, for deciphering the quantitative side of science; communications, to gain writing and speaking skills; and social science, for understanding how human behavior affects ecosystems.

For most professional jobs, Amanda says, ornithologists need a master’s degree that includes a research thesis. Those who want to develop their own research projects, work in high-level management positions, or teach at a university usually need a Ph.D. in a discipline related to their work. Amanda’s degrees are in wildlife biology (bachelor’s), zoology (master’s) and ecology (Ph.D.).

Experience. Aspiring ornithologists can begin getting experience as early as high school by contacting local birdwatching clubs, becoming active in networks for young birdwatchers, and attending workshops to learn the basics of fieldwork.

College students interested in ornithology should check job boards to find temporary positions; search online for internships, some of which may be paid; and volunteer on projects with ornithology, ecology, or wildlife organizations. The important thing, says Amanda, is to “get outside and get experience.”

What it's like

Getting outside is what first drew Amanda to ornithology. “I loved the outdoors and always had a curiosity about wildlife and ecology,” she says.

Rewards and challenges. Fieldwork allows ornithologists to combine their passions for studying nature and being outdoors. But that also means being out in all types of weather—sometimes, almost every day—if there are limited times during a season to observe a particular species. Also, there is travel to and from field locations and a variable work schedule that is far from standard.

But because ornithologists love what they do, says Amanda, they don't mind the unpredictable climate and hours. “So often when working outside in these beautiful field locations, surrounded by such fascinating birds, I can't believe that I am actually paid to do this,” she says.

Erratic financial support is a different story. “There's a lot of uncertainty about funding, both for research and for education,”

Amanda says. “That's the worst part of the job.”

Employment and wages. The U.S. Bureau of Labor Statistics (BLS) does not collect employment and wage data specifically on ornithologists. Instead, ornithologists are included among zoologists and wildlife biologists. In May 2012, BLS counted 18,650 zoologists and wildlife biologists; their median annual wage was \$57,710.

The American Ornithologists' Union, citing data from the Ornithological Societies of North America, estimates that there are about 6,000 ornithologists employed in the United States. But it's difficult to determine wages or a precise employment number, the organizations say, because of the overlap among scientists in related disciplines (such as ornithologists who also study mammals or forestry).

Passion. Many bird enthusiasts throughout the United States enjoy learning more about these creatures. Employment estimates don't count the large and growing segment of citizen scientists in ornithology: trained hobbyists, students, and volunteers who collect real data for science because of their interest in birds. “This is one area where amateurs can be exceptionally important,” Amanda says.

Whether employed as ornithologists or doing fieldwork as citizen scientists, these nature enthusiasts share the same passion. “Our work is meaningful,” says Amanda. “We're helping to conserve the world around us.”



For ornithologist Amanda Rodewald, fieldwork often includes capturing birds to band them.



Photo courtesy of Amanda Rodewald.



Green technologies and practices at work

Interested in a green job? You might have more options than you realize.

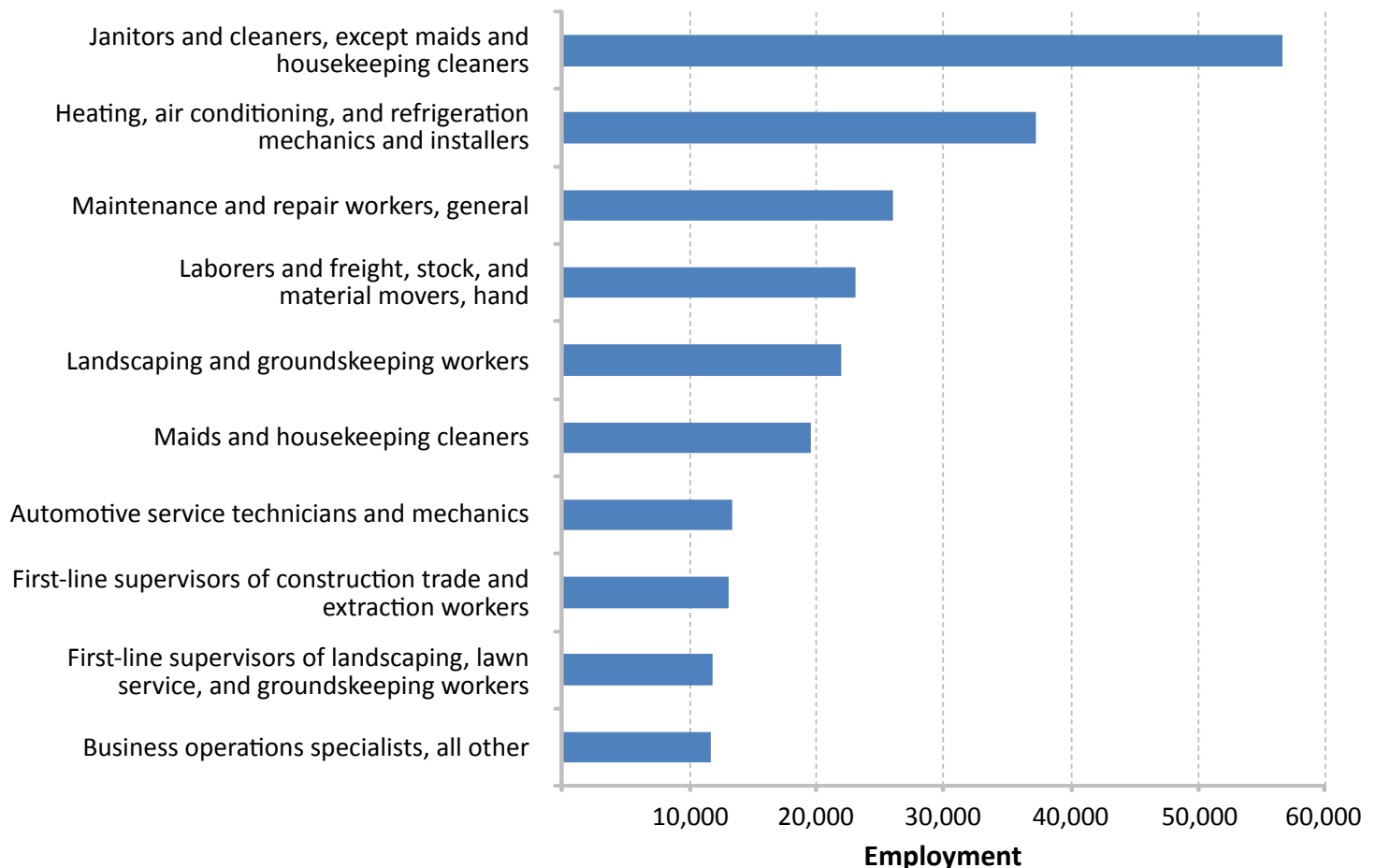
One of the ways that the U.S. Bureau of Labor Statistics (BLS) has tracked green jobs is by counting jobs in which workers spend more than half their time involved in technologies and practices that lessen the environmental impact of business operations. The chart shows occupations with the most jobs in green technologies and practices, according to BLS. In total, workers held about 854,700 of these jobs in August 2011.

Janitors and cleaners was among occupation with the greatest number of workers involved in green technologies and practices. As part of their job duties, janitors

and cleaners might replace and recycle incandescent light bulbs with more energy-efficient options and use environmentally friendly cleaning products. Heating, air conditioning, and refrigeration mechanics and installers might maintain or install energy-efficient equipment or geothermal heating and cooling systems. And landscaping and groundskeeping workers might design natural outdoor spaces that, compared with traditional settings, require less water, fertilizer, or pesticide.

For more information, see the January 2013 *Monthly Labor Review* visual essay on green technologies and practices at www.bls.gov/opub/mlr/2013/01/art4full.pdf.

Occupations with the most jobs in which workers spent more than half their time involved in green technologies and practices, August 2011



Source: U.S. Bureau of Labor Statistics, Green Technologies and Practices Survey.