Chapter 3.

Science and Engineering Labor Force

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Highlights

U.S. S&E Workforce: Definition, Size, and Growth

The S&E workforce can be defined in several ways: by workers in S&E occupations, by holders of S&E degrees, or by the use of S&E technical expertise on the job. The estimated size of the S&E workforce varies depending on the definitional criteria chosen.

- In 2013, estimates of the size of the S&E workforce ranged from approximately 6 million to more than 21 million depending on the definition used.
- In 2013, an estimated 5.7 million college graduates were employed in S&E occupations in the United States. The largest S&E occupations were computer and mathematical sciences (2.6 million), followed by engineering (1.6 million). Occupations in life sciences (638,000), social sciences (581,000), and physical sciences (319,000) combined to about the size of the engineering component.
- In 2013, about 21.1 million individuals in the United States had a bachelor's or higher level degree in an S&E field of study. The majority (15.8 million) held their highest level of degree (bachelor's, master's, professional, or doctorate) in an S&E field. Of these highest degrees, the most common fields were social sciences (6.4 million) and engineering (3.4 million). Computer and mathematical sciences (2.6 million), life sciences (2.4 million), and physical sciences (956,000) together were slightly less than the size of the social sciences component.
- Not all S&E degree holders work in jobs formally designated as S&E occupations. The number of college-educated individuals reporting that their jobs require at least a bachelor's degree level of technical expertise in S&E (17.7 million) is substantially higher than the number employed in S&E occupations (nearly 6 million), suggesting that the application of S&E knowledge and skills is widespread across the technologically sophisticated U.S. economy and not limited to jobs classified as S&E.

The S&E workforce has grown steadily over time.

- Between 1960 and 2013, the number of workers in S&E occupations grew at an average annual rate of 3%, compared to the 2% growth rate for the total workforce.
- Data from more recent years indicate that trends in S&E employment compared favorably to overall employment trends during and after the 2007–09 economic downturn. Between 2008 and 2014, the number of workers employed in S&E occupations rose by about half a million, whereas the total workforce stayed relatively steady.

S&E Workers in the Economy

Scientists and engineers work for all types of employers.

- The vast majority of scientists and engineers (individuals trained or employed in S&E) are employed in the business sector (70%), followed by the education (19%) and government (11%) sectors. Within the business sector, for-profit businesses employ the bulk of scientists and engineers.
- Among individuals with S&E doctorates, the proportion working in the business sector (46%) is similar to the proportion working in the education sector (45%). Within the education sector, over 90% work in 4-year colleges and universities, including those in postdoctoral and other temporary positions.

- The vast majority of educational institutions and government entities that employ scientists and engineers are large employers (i.e., having 100 or more employees). In contrast, scientists and engineers working in the business sector are distributed across firms of different sizes.
- Within the business sector, the industry with the largest number of workers in S&E occupations is professional, scientific, and technical services.
- Employment in S&E occupations is geographically concentrated in the United States. The 20 metropolitan areas with the largest proportion of the workforce employed in S&E occupations in 2014 accounted for 18% of nationwide S&E employment, compared to 8% of all employment.

S&E Labor Market Conditions

Whether measured by S&E occupation or degree, S&E workers have higher earnings than other comparable workers.

- Half of the workers in S&E occupations earned $81,000 or more in 2014, which is more than double the median salaries ($36,000) of the total workforce.
- Employed college graduates with a highest degree in S&E earn more than those with non-S&E degrees (median salaries in 2013 were $65,000 and $52,000, respectively). For the most part, the earnings premium associated with an S&E degree is present across early, mid, and later career stages.

The S&E labor force is less likely than others to experience unemployment.

- Unemployment rates for college-educated individuals in S&E occupations tend to be lower than those for all college graduates and much lower than those for the overall labor force: In February 2013, about 3.8% of scientists and engineers and 4.3% of all college-educated individuals in the labor force were unemployed, about half the official unemployment rate for the entire U.S. labor force (8.1%).
- Unemployment rates for S&E doctorate holders (2.3%) are even lower than for those at other degree levels (4.2% and 3.7% among S&E bachelor's and master's degree holders, respectively).

Demographics of the S&E Workforce

Mirroring U.S. population trends, the S&E labor force is aging. Additionally, a larger proportion of older scientists and engineers remain in the labor force in 2013 than in 1993.

- The median age of scientists and engineers in the labor force was 43 years in 2013, compared to 41 years in 1993.
- Between 1993 and 2013, an increasing percentage of scientists and engineers in their 60s reported that they were still in the labor force. Whereas 54% of scientists and engineers between the ages of 60 and 69 were in the labor force in 1993, the comparable percentage rose to 64% in 2013.

Women remain underrepresented in the S&E workforce, but less so than in the past.

- In 2013, women constituted 50% of the college-educated workforce, 39% of employed individuals whose highest degree was in an S&E field, and 29% of those in S&E occupations. The corresponding 1993 shares were 43%, 31%, and 23%, respectively.

- Women employed in S&E occupations are concentrated in different occupational categories than men, with relatively high proportions in social sciences (62%) and life sciences (48%) and relatively low proportions in engineering (15%), physical sciences (31%), and computer and mathematical sciences (25%).

Historically underrepresented racial and ethnic groups, particularly blacks and Hispanics, continue to be part of the S&E workforce at rates lower than their presence in the U.S. population, whereas Asians and foreign-born individuals are represented in the S&E workforce at higher rates.

- Hispanics, blacks, and American Indians or Alaska Natives together make up 27% of the U.S. population age 21 and older but a much smaller proportion of the S&E workforce: 14% of S&E highest degree holders and 11% of workers in S&E occupations.
- Conversely, Asians make up 5% of the U.S. population age 21 and older but account for 17% of those employed in S&E occupations. Asians have a large presence in engineering and computer sciences occupations, particularly among computer software and hardware engineers, software developers, bioengineers or biomedical engineers, and postsecondary teachers in engineering.
- About 70% of workers in S&E occupations are non-Hispanic whites, which is comparable to their overall representation in the U.S. population age 21 and older (66%).
- Foreign-born individuals account for 27% of all workers in S&E occupations, which is substantially higher than their share of the entire college-educated workforce (15%).
- Foreign-born workers employed in S&E occupations tend to have higher levels of education than their U.S. native-born counterparts.

A variety of indicators point to a decline, albeit temporary, in the immigration of scientists and engineers during the 2007–09 economic downturn.

- Declines in temporary work visas issued to high-skill workers during the 2007–09 economic downturn have reversed in recent years. Issuance of new H-1B visas has shown continued increase since 2009 and by 2014 exceeded the pre-recession levels. In some other temporary work visa categories, however, the issuance of new visas in 2014 remained below pre-recession levels.
- After rising for most of the decade 2000–09, the number of foreign recipients of U.S. S&E doctoral degrees declined in 2009 and 2010. It has risen since 2011 and now exceeds pre-recession levels.
- About two-thirds of temporary visa holders earning a U.S. S&E doctorate remain in the United States at least 5 years. This proportion reached 67% in 2005, declined during the economic downturn, and then rose to 66% in 2011.

Global S&E Labor Force

Worldwide, the number of workers engaged in research has been growing.

- Among countries with large numbers of researchers—defined as workers engaged in the creation and development of new knowledge, products, and processes—growth since 2000 has been most rapid in China and South Korea.
- The United States and the European Union experienced steady growth but at lower rates than China or South Korea.
- Russia and, to some extent, Japan were exceptions to the worldwide trend. Between 2000 and 2013, the number of researchers in Japan rose very slightly; in Russia, the number declined.

Introduction

Chapter Overview

Policymakers and scholars consistently emphasize innovation based on S&E research and development as a vehicle for a nation's economic growth and global competitiveness. In the increasingly interconnected 21st century world, workers with S&E expertise are integral to a nation's innovative capacity because of their high skill level, their creative ideas, and their ability not only to advance basic scientific knowledge but also to transform advances in fundamental knowledge into tangible and useful products and services. As a result, these workers make important contributions to improving living standards and accelerating the pace of a nation's economic and productivity growth.

Chapter Organization

The U.S. workforce includes both individuals employed in S&E occupations and individuals educated in S&E fields but employed in a variety of non-S&E occupations. Many more individuals have S&E degrees than work in S&E occupations. Indicative of a knowledge-based economy, many individuals in non-S&E occupations reported that their work nevertheless requires a bachelor's degree level of S&E expertise. Therefore, the first section in this chapter, "U.S. S&E Workforce: Definition, Size, and Growth," discusses the S&E workforce based on three measures: workers in S&E occupations, holders of S&E degrees, and use of S&E technical expertise on the job. This section also discusses the interplay between educational background and occupational choice.

The second section in this chapter, "S&E Workers in the Economy," examines the distribution of S&E workers across employment sectors. It describes the distribution of S&E workers across sectors (e.g., business, education, government) as well as within particular sectors (e.g., local, state, and federal government). This section also presents data on geographic distribution of S&E employment in the United States. Data on R&D activity and work-related training by S&E workers are also discussed.

The third section, "S&E Labor Market Conditions," looks at labor market outcomes for S&E workers. Data in this section focus on earnings and unemployment, with a particular focus on recent S&E graduates.

The next three sections cover labor force demographics. "Age and Retirement of the S&E Workforce" presents data on the age distribution and retirement patterns of S&E workers. "Women and Minorities in the S&E Workforce" focuses on S&E participation by women and by racial and ethnic minorities; this section also presents data on salary differences by sex and by race and ethnicity. "Immigration and the S&E Workforce" presents data on S&E participation by foreign-born individuals in the United States.

The final section in this chapter is "Global S&E Labor Force." Although there are indications that the global S&E labor force has grown, international data on the characteristics of this broader labor force are particularly limited and are not always comparable with data for the United States. In this final section, data from the Organisation for Economic Co-operation and Development (OECD) are used to present indicators of worldwide R&D employment.

This chapter uses a variety of data sources, including, but not limited to, the National Science Foundation's (NSF's) Scientists and Engineers Statistical Data System (SESTAT), the Census Bureau's American Community Survey (ACS), the Occupational Employment Statistics (OES) survey administered by the Bureau of Labor Statistics (BLS), and the Current Population Survey (CPS) sponsored jointly by the Census Bureau and BLS. Different sources cover different segments of the population and different levels of detail on the various topics. (See Table 3-1 and sidebar, NSF's Scientists and Engineers Statistical Data System) Although data collection methods and definitions can differ across surveys in ways that affect estimates, combining data from different sources facilitates an accurate and comprehensive picture of the very specialized S&E workforce. A particular measure or categorization of the workforce may be better suited for addressing some questions than others, and a particular data source may not include information in every category. Analyses of long-term trends, international trends, and comparison of S&E and non-S&E workers are discussed whenever data are available.

NSF's Scientists and Engineers Statistical Data System

NSF's Scientists and Engineers Statistical Data System (SESTAT) provides detailed employment, education, and demographic data for scientists and engineers under age 76 residing in the United States. SESTAT currently defines scientists and engineers as individuals who have college degrees in S&E or S&E-related fields or who are working in S&E or S&E-related occupations. (See Table 3-2 for definitions of S&E and S&E-related occupations.) Unless otherwise noted, this chapter uses the term "scientists and engineers" to refer to this broad SESTAT population and the term "college graduates" to refer to the population with at least a bachelor's level degree. Data available through SESTAT are collected by two large demographic and workforce surveys of individuals conducted by NSF: the National Survey of College Graduates (NSCG) and the Survey of Doctorate Recipients (SDR). SESTAT integrates the data from the two surveys, and together the data provide a comprehensive picture of scientists and engineers in the United States.

The NSCG is the central component of SESTAT, providing data that detail the characteristics of the entire bachelor's degree holder population in the United States (regardless of their S&E background). Its population of college graduates includes individuals trained as scientists and engineers who hold at least a bachelor's degree. Because it covers the entire college graduate population residing in the United States, the NSCG provides information on individuals educated or employed in S&E fields as well as those educated or employed in non-S&E fields. The data presented in this chapter for all college graduates (regardless of S&E background) are mostly based on the NSCG.

Whereas NSCG data cover the general college-educated population, the SDR data add to SESTAT doctoral scientists and engineers who earned their research doctoral degree in a science, engineering, or health (SEH) field from a U.S. academic institution. The SDR is a longitudinal biennial survey that has been conducted since 1973. The survey follows a sample of SEH doctoral degree holders from the year of their U.S. doctoral degree award until age 76. The panel is refreshed each survey cycle with a sample of new SEH doctoral degree recipients.

For more information on SESTAT, see http://www.nsf.gov/statistics/sestat/

Table 3-1 **Major sources of data on the U.S. labor force**

Data source	Data collection agency	Data years	Major topics	Respondent	Coverage
			Worker occupation		All full-time and part-time wage and

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Data source	Data collection agency	Data years	Major topics	Respondent	Coverage
Occupational Employment Statistics (OES), http://www.bls.gov/oes/	Department of Labor, Bureau of Labor Statistics	Through 2014	Salary Industry Employer location (national, state, metropolitan statistical area)	Employing organizations	salary workers in nonfarm industries; does not cover self-employed, owners and partners in unincorporated firms, household workers, or unpaid family workers
Scientists and Engineers Statistical Data System, http://sestat.nsf.gov. See sidebar "NSF's Scientists and Engineers Statistical Data System"	National Science Foundation, National Center for Science and Engineering Statistics	Through 2013	Employment status Occupation Job characteristics (work activities, technical expertise) Salary Detailed educational history Demographic characteristics	Individuals	Individuals with bachelor's degree or higher in S&E or S&E-related field or with non-S&E degrees but working in S&E or S&E-related occupation
American Community Survey (ACS), http://www.census.gov/acs/www/	Department of Commerce, Census Bureau	Through 2013	Employment status Occupation First bachelor's degree field Educational attainment Demographic characteristics	Households	U.S. population
			Employment status		

Data source	Data collection agency	Data years	Major topics	Respondent	Coverage
Current Population Survey (CPS), http://www.census.gov/cps/	Department of Labor, Bureau of Labor Statistics	Through 2015	Occupation Educational attainment Demographic characteristics	Households	Civilian noninstitutional population age 16 or over

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U.S. S&E Workforce: Definition, Size, and Growth

Definition of the S&E Workforce

Because there is no standard definition of S&E workers, this section presents multiple categorizations for measuring the size of the S&E workforce.[i] In general, this section defines the S&E workforce to include people who either work in S&E occupations or hold S&E degrees. However, the application of S&E knowledge and skills is not limited to jobs classified as S&E; the number of workers reporting that their jobs require at least a bachelor's degree level of knowledge in one or more S&E fields exceeds the number of jobs in the economy with a formal S&E label. Therefore, this section also presents data on the use of S&E technical expertise on the job to provide an estimate of the S&E workforce. The estimated number of scientists and engineers varies based on the criteria applied to define the S&E workforce.

U.S. federal occupation data classify workers by the activities or tasks they primarily perform in their jobs. The NSF and Census Bureau occupational data in this chapter come from federal statistical surveys in which individuals or household members provide information about job titles and work activities. This information is used to classify jobs into standard occupational categories based on the Standard Occupational Classification (SOC) system.[ii] In contrast, the BLS-administered OES survey relies on employers to classify their workers using SOC definitions. Differences between employer- and individual-provided information can affect the content of occupational data.

NSF has developed a widely used set of SOC categories that it calls *S&E occupations*. Very broadly, these occupations include life scientists, computer and mathematical scientists, physical scientists, social scientists, and engineers. NSF also includes postsecondary teachers of these fields in S&E occupations. A second category of occupations, *S&E-related occupations*, includes health-related occupations, S&E managers, S&E technicians and technologists, architects, actuaries, S&E precollege teachers, and postsecondary teachers in S&E-related fields. The S&E occupations are generally assumed to require at least a bachelor's degree level of education in an S&E field. The vast majority of S&E-related occupations also require S&E knowledge or training, but an S&E bachelor's degree may not be a required credential for employment in some of these occupations. Examples include health technicians and computer network managers. Other occupations, although classified as *non-S&E occupations,* may include individuals who use S&E technical expertise in their work. Examples include technical writers who edit scientific publications and salespeople who sell specialized research equipment to chemists and biologists. The NSF occupational classification of S&E, S&E-related, and non-S&E occupations appears in Table 3-2 along with the NSF educational classification of S&E, S&E-related, and non-S&E degree fields.

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[i] The standard definition of the term *labor force* is a subset of the population that includes both those who are employed and those who are not working but seeking work (unemployed); other individuals are not considered to be in the labor force. Unless otherwise noted, when data refer only to employed persons, the term *workforce* is used. For data on unemployment rates by occupation, calculations assume that unemployed individuals are seeking further employment in their most recent occupation.

[ii] The SOC is used by federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, and disseminating data. Detailed information on the SOC is available at http://www.bls.gov/SOC/.

Table 3-2 Classification of degree fields and occupations

			Occupation classification	
Classification	Degree field	Occupation	STEM	S&T
S&E	Biological, agricultural, and environmental life sciences	Biological, agricultural, and environmental life scientists	X	X
	Computer and mathematical sciences	Computer and mathematical scientists	X	X
	Physical sciences	Physical scientists	X	X
	Social sciences	Social scientists	X	X
	Engineering	Engineers	X	X
		S&E postsecondary teachers		
S&E-related	Health fields	Health-related occupations		
	Science and math teacher education	S&E managers	X	
		S&E precollege teachers		
	Technology and technical fields	S&E technicians and technologists	X	X
	Architecture	Architects		
	Actuarial science	Actuaries		
		S&E-related postsecondary teachers		
Non-S&E	Management and administration	Non-S&E managers		
		Management-related occupations		
	Education (except science and math teacher education)	Non-S&E precollege teachers		
		Non-S&E postsecondary teachers		
	Social services and related fields	Social services occupations		
	Sales and marketing	Sales and marketing occupations		
	Arts and humanities	Arts and humanities occupations		
	Other fields	Other occupations		

NOTES: S&T = science and technology; STEM = science, technology, engineering, and mathematics.
The designations STEM and S&T refer to occupations only. For more detailed classification of occupations and degrees by S&E, S&E-related, and non-S&E, see National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT), http://sestat.nsf.gov.
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Indicative of a knowledge-based economy, the number of individuals who have S&E training or who reported applying S&E technical expertise in their jobs exceeds the number of individuals employed in jobs that are categorized as S&E. As such, a relatively narrow definition of the S&E workforce consists of workers in occupations that NSF designates as S&E occupations. In comparison, a much broader definition of an S&E worker, utilized by NSF's SESTAT, includes any individual with a bachelor's or higher level degree in an S&E or S&E-related field of study or a college graduate in any field employed in an S&E or S&E-related occupation. (See sidebar, NSF's Scientists and Engineers Statistical Data System.) As noted earlier, the S&E workforce may also be defined by the technical expertise or training required to perform a job. Unlike information on occupational categories or educational credentials, information on the use of technical knowledge, skills, or expertise in a person's job reflects that individual's subjective opinion about the content and characteristics of the job.[iii] The next section provides estimates of the size of the S&E workforce using all three definitions.

Other general terms, including science, technology, engineering, and mathematics (STEM), science and technology (S&T), and science, engineering, and technology (SET), are often used to designate the part of the labor force that works with S&E. These terms are broadly equivalent and have no standard definition.

[iii] As expected, this subjective measure varies across occupations. For example, in 2013, among postsecondary teachers of chemistry, 96% said that their job required at least a bachelor's degree level of knowledge in engineering, computer sciences, mathematics, or natural sciences. Among postsecondary teachers of business commerce or marketing, 84% said that their job required at least this level of expertise in other fields such as health, business, or education. Among the SESTAT population whose occupation is secretary/receptionist/typist, only about 5% said that their job required a bachelor's degree level of knowledge in engineering, computer sciences, mathematics, or natural sciences; about 5% said that their job required at least a bachelor's degree level of knowledge in social sciences; and 17% said that their job required at least a bachelor's degree level of expertise in other fields such as health, business, or education.

Size of the S&E Workforce

When defined by occupation, the S&E workforce totals between 6.2 million and 6.3 million people according to the most recent estimates (Table 3-3). Those in S&E occupations who had at least a bachelor's degree are estimated at between 4.6 million and 5.7 million (Table 3-3).[i] By far the largest categories of S&E occupations are in computer and mathematical sciences and engineering, which together account for about 73% (among college-educated workers) to 84% (among workers of all education levels) of all employed workers in S&E occupations (Figure 3-1). Occupations in life, social, and physical sciences each employ a smaller proportion of S&E workers.

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[i] Estimates of the size of the S&E workforce may vary across the different surveys because of differences in the scope of the data collection (SESTAT surveys collect data from individuals with at least a bachelor's degree); because of the type of survey respondent (SESTAT surveys collect data from individuals, OES collects data from employers, and ACS collects data from households); or because of the level of detail collected on an occupation, which aids in classifying a reported occupation into a standard occupational category. For example, the SESTAT estimate of the number of workers in S&E occupations includes postsecondary teachers of S&E fields; however, postsecondary teachers in ACS are grouped under a single occupation code regardless of field and are therefore not included in the ACS estimate of the number of workers in S&E occupations.

Table 3-3 Measures and size of U.S. S&E workforce: 2013 and 2014

Measure	Education coverage	Data source	Number of individuals
Occupation			
Employed in S&E occupations	All education levels	2014 BLS OES Survey	6,319,000
Employed in S&E occupations	Bachelor's and above	2013 NSF/NCSES SESTAT	5,749,000
Employed in S&E occupations	All education levels	2013 Census Bureau ACS	6,197,000
Employed in S&E occupations	Bachelor's and above	2013 Census Bureau ACS	4,630,000
Education			
At least one degree in S&E field	Bachelor's and above	2013 NSF/NCSES SESTAT	21,121,000
Highest degree in S&E field	Bachelor's and above	2013 NSF/NCSES SESTAT	15,811,000
Job closely related to highest degree	Bachelor's and above	2013 NSF/NCSES SESTAT	5,847,000
S&E occupation	Bachelor's and above	2013 NSF/NCSES SESTAT	3,033,000
Other occupation	Bachelor's and above	2013 NSF/NCSES SESTAT	2,814,000
Job somewhat related to highest degree	Bachelor's and above	2013 NSF/NCSES SESTAT	3,716,000
S&E occupation	Bachelor's and above	2013 NSF/NCSES SESTAT	1,050,000
Other occupation	Bachelor's and above	2013 NSF/NCSES SESTAT	2,665,000
Job requires S&E technical expertise at bachelor's level			
In one or more S&E fields	Bachelor's and above	2013 NSF/NCSES SESTAT NSCG	17,655,000
Engineering, computer science, mathematics, or natural sciences	Bachelor's and above	2013 NSF/NCSES SESTAT NSCG	12,649,000
Social sciences	Bachelor's and above	2013 NSF/NCSES SESTAT NSCG	8,094,000

NOTES: ACS = American Community Survey; BLS = Bureau of Labor Statistics; NSCG = National Survey of College Graduates; NSF/NCSES = National Science Foundation, National Center for Science and Engineering Statistics; OES = Occupational Employment Statistics; SESTAT = Scientists and Engineers Statistical Data System.

Estimates of the S&E workforce vary across the example surveys because of differences in the scope of the data collection (SESTAT surveys collect data from individuals with bachelor's degrees and above only);

	because of the survey respondent (SESTAT surveys collect data from individuals, OES collects data from establishments, and ACS collects data from households); or because of the level of detail collected on an occupation, which aids in classifying a reported occupation into a standard occupational category. All of these differences can affect the estimates. For example, the SESTAT estimate of the number of workers in S&E occupations includes postsecondary teachers of S&E fields; however, postsecondary teachers in ACS are grouped under a single occupation code regardless of field and are therefore not included in the ACS estimate of the number of workers in S&E occupations. The total for "at least one degree in S&E field" and "highest degree in S&E field" includes individuals who are employed as well as those who are unemployed and out of the labor force.
SOURCES:	BLS, OES Survey (2014); Census Bureau, ACS (2013); NSF/NCSES, NSCG (2013) and SESTAT (2013) integrated file.
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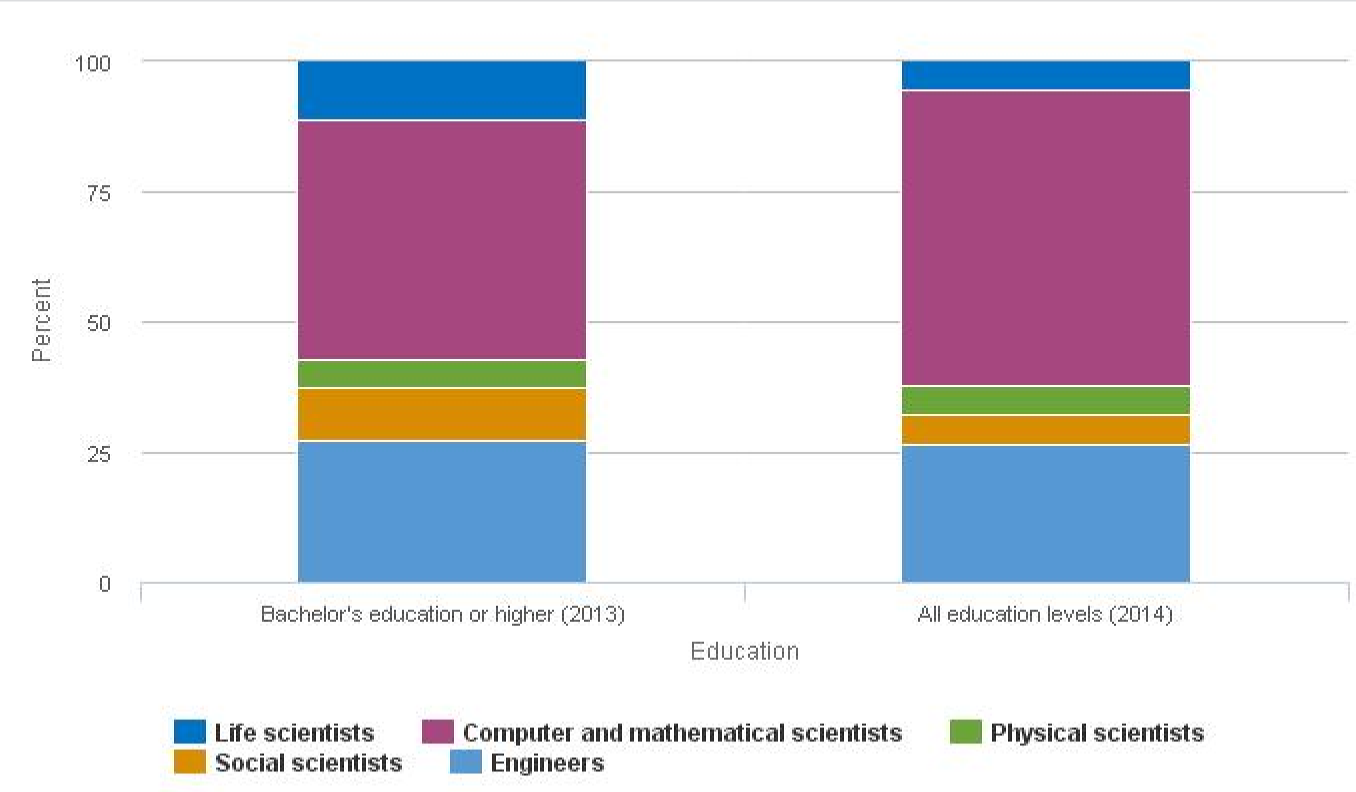
Figure 3-1

Employment in S&E occupations, by broad occupational category: 2013 and 2014



SOURCES: Bureau of Labor Statistics, Occupational Employment Statistics Survey, 2014; National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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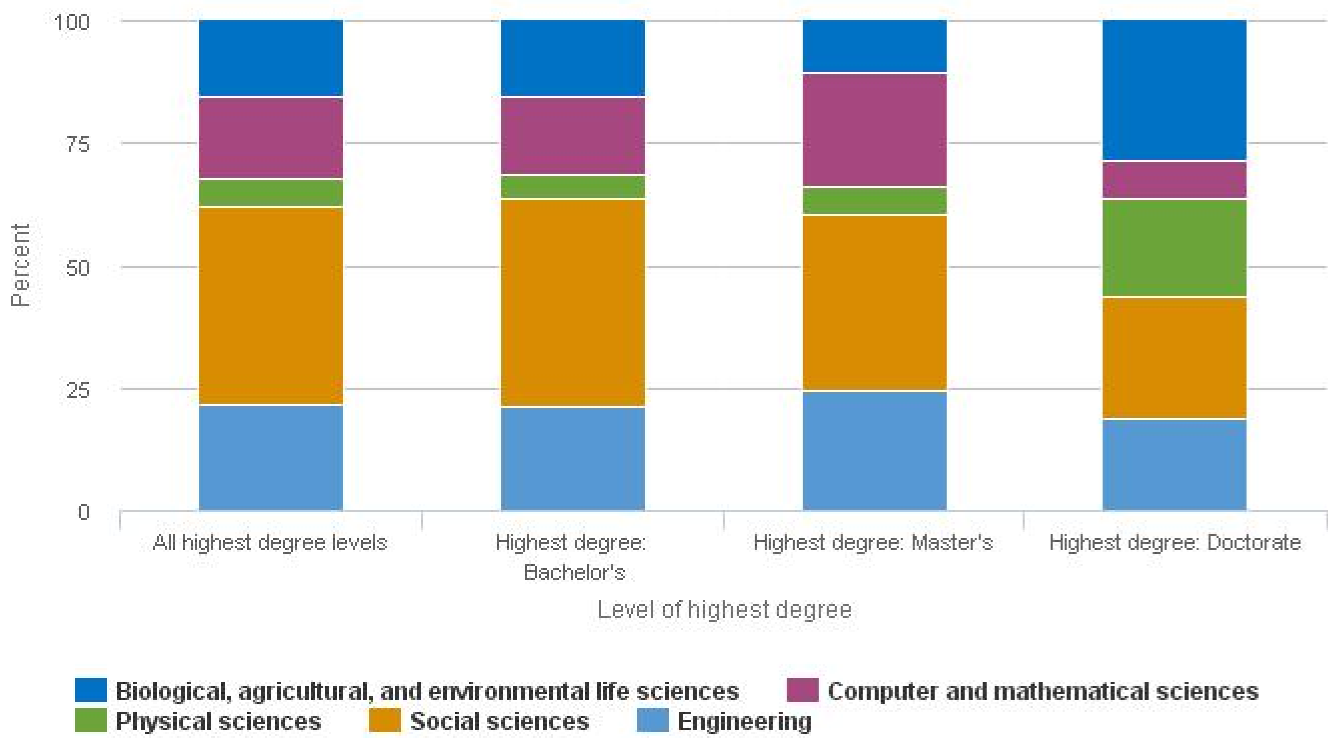
As noted earlier, S&E degree holders greatly outnumber those currently employed in S&E occupations. In 2013, about 21 million college graduates in the United States had a bachelor's or higher level degree in an S&E field of study (Table 3-3). About three-fourths of these college graduates (15.8 million) attained their highest degree—a bachelor's, master's, professional, or doctorate—in an S&E field (in this chapter, these individuals are referred to as S&E highest degree holders). An individual's highest degree is often an accurate representation of the skills and credentials that one employs in the labor market, which is why the data presented in this chapter by educational attainment are generally provided for highest degree. Overall, across all S&E highest degrees, social sciences and engineering were the most common degree fields (Figure 3-2).[ii] The 15.8 million with an S&E highest degree includes 11.4 million with bachelor's degrees, 3.3 million with master's degrees, 1.0 million with doctorates, and 52,000 with professional degrees.

[ii] Among those with doctorates in an S&E field, life sciences and social sciences were the most common fields, followed by physical sciences, engineering, and computer and mathematical sciences.

Figure 3-2

S&E degrees among college graduates, by field and level of highest degree: 2013



NOTE: All degree levels includes professional degrees not shown separately.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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A majority of S&E degree holders (60%) reported that their job was either closely or somewhat related to their field of highest degree (Table 3-3). Because many of these individuals were employed in occupations not categorized as S&E, this suggests that the application of S&E knowledge and skills is widespread across the U.S. economy and not limited to occupations classified as S&E.

The extensive use of S&E expertise in the workplace is also evident from the number of college graduates who indicate that their job requires technical expertise at the bachelor's degree level in S&E fields. According to the 2013 National Survey of College Graduates (NSCG), nearly 17.7 million college graduates reported that their jobs required at least this level of technical expertise in one or more S&E fields (Table 3-3); this figure is almost three times as large as the nearly 6 million college graduates employed in S&E occupations.

Growth of the S&E Workforce

The S&E workforce has grown faster over time than the overall workforce. According to Census Bureau data, employment in S&E occupations grew from about 1.1 million in 1960 to about 6.2 million in 2013 (Figure 3-3).[i] This represents an average annual growth rate of 3%, compared to a 2% growth rate in total employment during this period. S&E occupational employment as a share of total employment doubled: from about 2% in 1960 to about 4% in 2013. See sidebar, Projected Growth of Employment in S&E Occupations for BLS data on occupational projections for the period 2012–22.

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[i] The data on S&E employment levels for 1960 and 2013 are calculated using the Census Bureau's 1960 Decennial Census and 2013 American Community Survey (ACS) microdata, respectively, adjusted by the Integrated Public Use Microdata Series (IPUMS) from the University of Minnesota's Minnesota Population Center (http://www.ipums.org). Occupational classification systems have changed over time, which limits the comparability of occupational counts over time. For example, computer occupations were not present in the occupational classification system used in 1960. For more information on the change in occupational classification systems, see Wyatt and Hecker's report, "Occupational Changes During the 20th Century" (*Monthly Labor Review*, March 2006). S&E employment levels for 1960 and 2013 include workers at all education levels and do not include S&E postsecondary teachers. Although the 1960 Decennial Census data allow for separate identification of S&E postsecondary teachers, the 2013 ACS data aggregate all postsecondary teachers into one occupation code and therefore do not allow for separate identification of S&E postsecondary teachers. For 1960, including S&E postsecondary teachers would increase the number of workers employed in S&E occupations to nearly 1.2 million. See Appendix Table 3-1 for a list of S&E occupations in the 1960 Decennial Census and 2013 ACS.

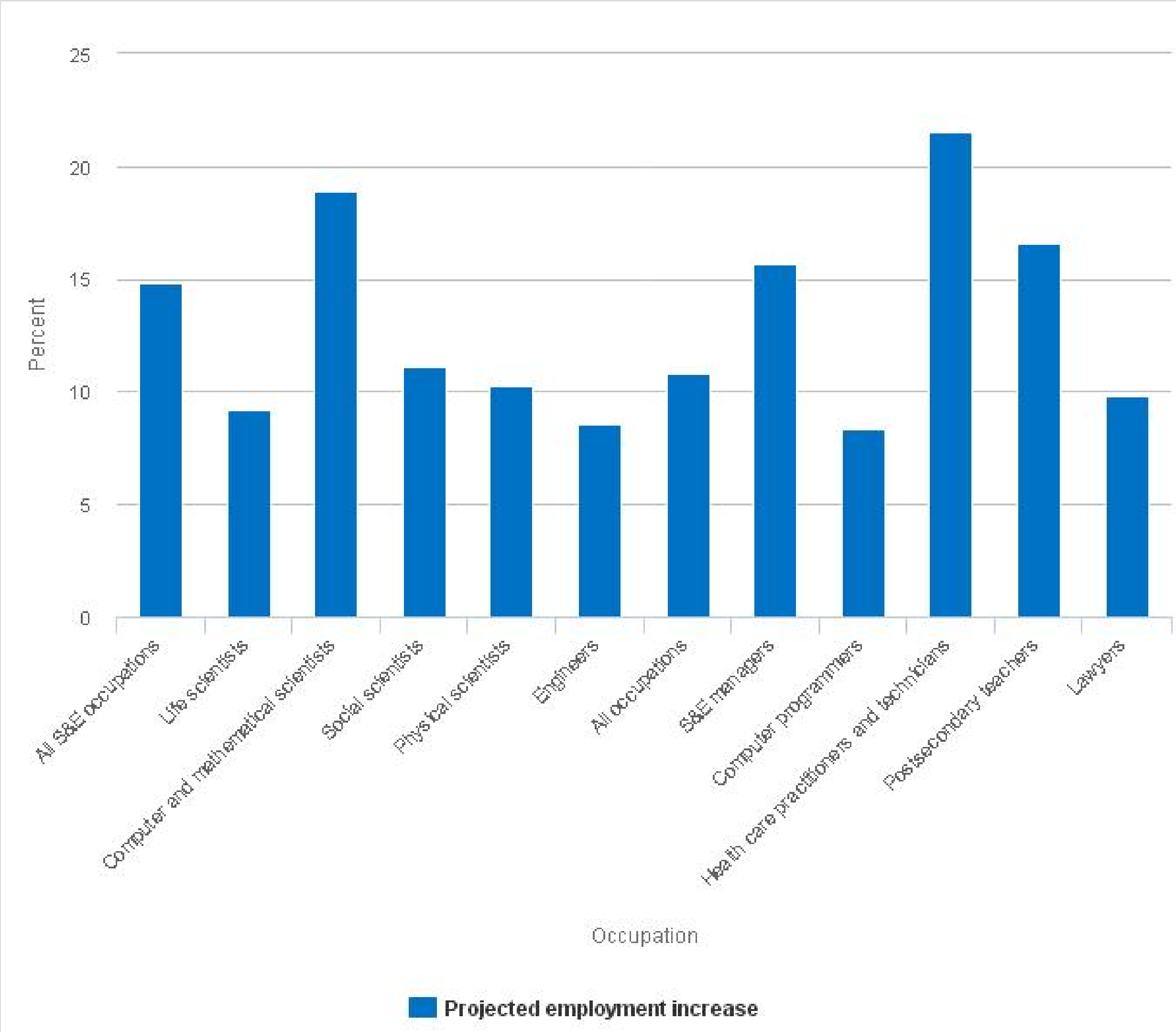
Projected Growth of Employment in S&E Occupations

This sidebar presents the most recent data from the Bureau of Labor Statistics (BLS) on occupational projections for the period 2012–22. While interpreting the data, it should be kept in mind that employment projections are uncertain. Many industry and government decisions that affect hiring are closely linked to national and global fluctuations in aggregate economic activity, which are difficult to forecast long in advance. In addition, technological and other innovations will influence demand for workers in specific occupations. The assumptions underlying projections are sensitive to fundamental empirical relationships, and, as a result, may become less accurate as overall economic conditions change.*

BLS occupational projections for the period 2012–22 suggest that total employment in occupations that NSF classifies as S&E will increase at a faster rate (15%) than employment in all occupations (11%) (Figure 3-A; Table 3-A). These projections are based only on the demand for narrowly defined S&E occupations and do not include the wider range of occupations in which S&E degree holders often use their training.

Figure 3-A

Projected increases in employment for S&E and other selected occupations: 2012–22



SOURCE: Bureau of Labor Statistics, Employment Projections program, 2012–22, special tabulations of 2012–22 Employment Projections. See appendix table 3-2.

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Table 3-A **Bureau of Labor Statistics projections of employment and job openings in S&E and other selected occupations: 2012–22**

(Thousands)

Occupation	BLS National Employment Matrix 2012 estimate	BLS projected 2022 employment	Job openings from growth and net replacements, 2012–22	10-year growth in total employment (%)	10-year job openings as percentage of 2012 employment
All occupations	145,356	160,984	50,557	10.8	34.8
All S&E	5,914	6,791	2,047	14.8	34.6
Computer and mathematical scientists	3,445	4,096	1,177	18.9	34.2
Life scientists	295	322	105	9.2	35.6
Physical scientists	297	328	111	10.3	37.2
Social scientists	287	319	110	11.1	38.3
Engineers	1,590	1,726	544	8.6	34.2
S&E-related occupations					
S&E managers	894	1,034	321	15.7	35.9
S&E technicians and technologists	1,126	1,183	331	5.1	29.4
Computer programmers	344	372	118	8.3	34.4
Health care practitioners and technicians	8,050	9,783	3,378	21.5	42.0
Selected other occupations					
Postsecondary teachers	1,831	2,135	579	16.6	31.6
Lawyers	760	835	197	9.8	25.9

NOTES:

BLS = Bureau of Labor Statistics.

Estimates of current and projected employment for 2012–22 are from BLS's National Employment Matrix; data in the matrix are from the Occupational Employment Statistics (OES) Survey and the Current Population Survey (CPS). Together, these sources cover paid workers, self-employed workers, and unpaid family workers

	in all industries, agriculture, and private households. Because data are derived from multiple sources, they can often differ from employment data provided by OES Survey, CPS, or other employment surveys alone. BLS does not make projections for S&E occupations as a group and some of the S&E and S&E-related occupational categories as defined by the National Science Foundation (NSF); numbers in the table are based on the sum of BLS projections for occupations that the NSF includes in the respective categories. See appendix table 3-2.
SOURCE:	BLS, Employment Projections program, 2012–22, special tabulations of 2012–22 Employment Projections.
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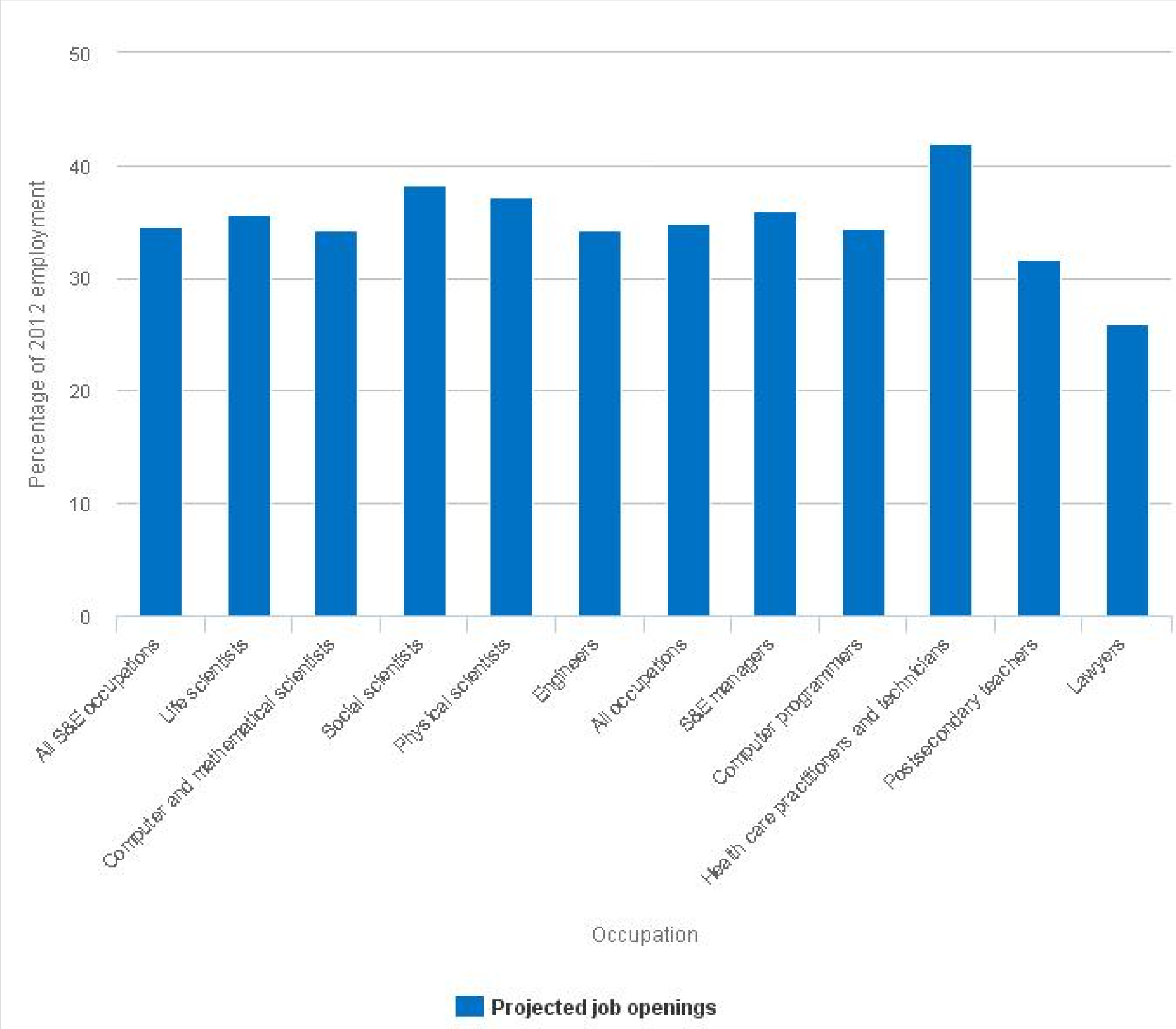
During the period 2012–22, job openings in NSF-identified S&E occupations are projected to represent about one-third (35%) of current employment in 2012, which is similar to the proportion of job openings in all occupations (35%) (Figure 3-B). Job openings include both new jobs and openings caused by workers permanently leaving the occupations.

Figure 3-B

Projected job openings in S&E and other selected occupations: 2012–22



SOURCE: Bureau of Labor Statistics, Employment Projections program, 2012–22, special tabulations of 2012–22 Employment Projections. See appendix table 3-2.

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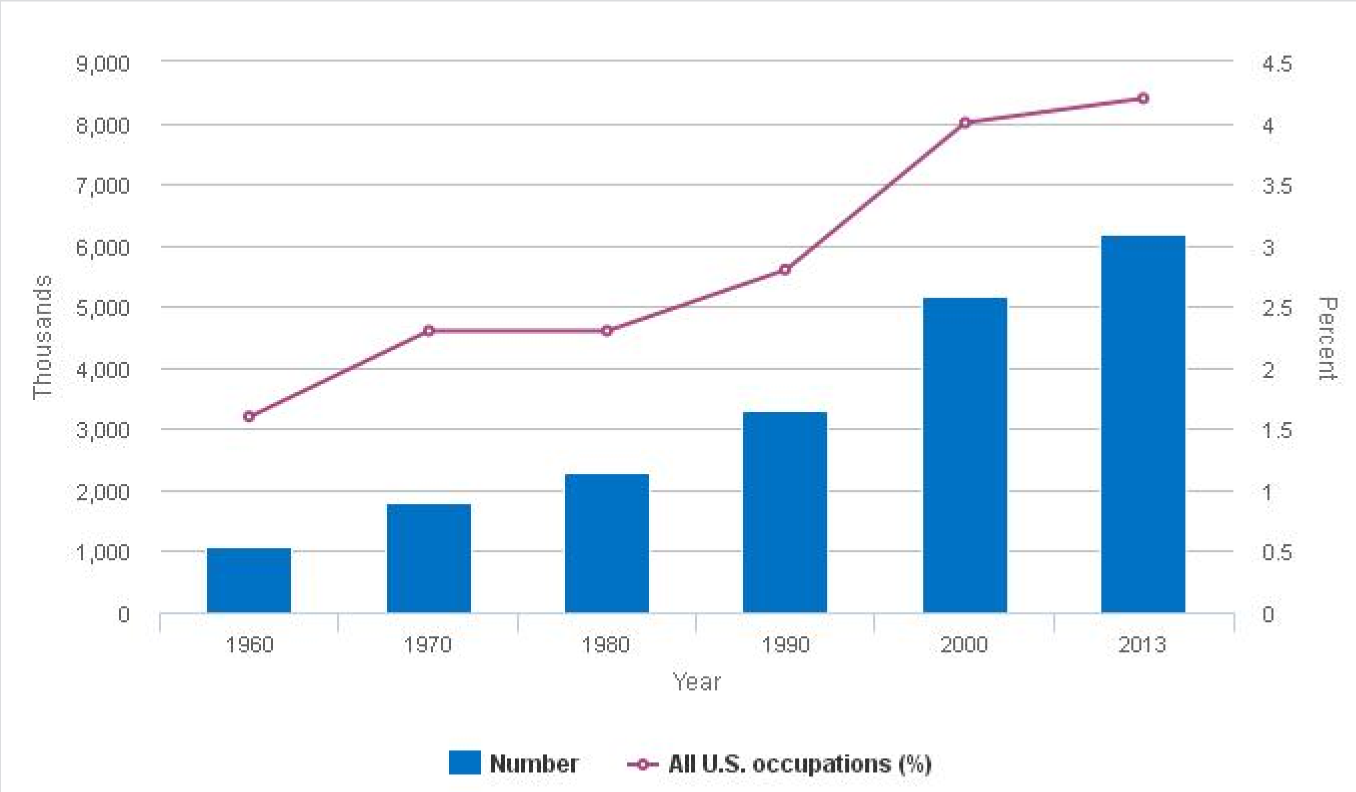
Of the BLS-projected net job openings in NSF-identified S&E occupations, 57% are projected to be in computer and mathematical sciences occupations, the largest subcategory of S&E occupations (Table 3-A). This occupational group also has the largest projected growth rate (19%) among NSF-identified S&E groups. Engineering occupations, the second largest subcategory of S&E occupations, are expected to generate about one-fourth (27%) of all job openings in S&E occupations during the period 2012–22; however, the growth rate in these occupations (9%) is projected to be lower than the growth rate for all occupations (11%). The other broad categories of S&E occupations—life sciences, social sciences, and physical sciences occupations—account for much smaller proportions of S&E occupations and are projected to have a growth rate between 9% and 11%. Job openings in the broad categories of S&E occupations are projected to represent relatively similar proportions of current employment in their respective fields, ranging from 34% to 38%.

In addition to S&E occupations, Table 3-A also shows selected other occupations that contain significant numbers of S&E-trained workers. Among these occupations, the health care practitioners and technicians group, which employs more workers than all S&E occupations combined, is projected to grow 22%, double the growth rate for all occupations. The postsecondary teachers group, which includes all fields of instruction, and the S&E managers group are projected to grow 17% and 16%, respectively, both of which are slightly higher than the 15% projected growth rate for all S&E occupations. In contrast, BLS projects that the computer programmers group and the S&E technicians and technologists group will grow more slowly than all S&E occupations.

*The mean absolute percentage error in the 1996 BLS projection of 2006 employment in detailed occupations was 17.6% (Wyatt 2010). The inaccuracies in the 1996 projection of 2006 employment were primarily the result of not anticipating the housing bubble or increases in oil prices (Wyatt 2010).

Figure 3-3

Individuals employed in S&E occupations in the United States: Selected years, 1960–2013



NOTE: Data include people at all education levels.

SOURCES: Census Bureau, Decennial Census (1960–2000) and American Community Survey (2013) microdata, downloaded from the Integrated Public Use Microdata Series (IPUMS), University of Minnesota (http://www.ipums.org).

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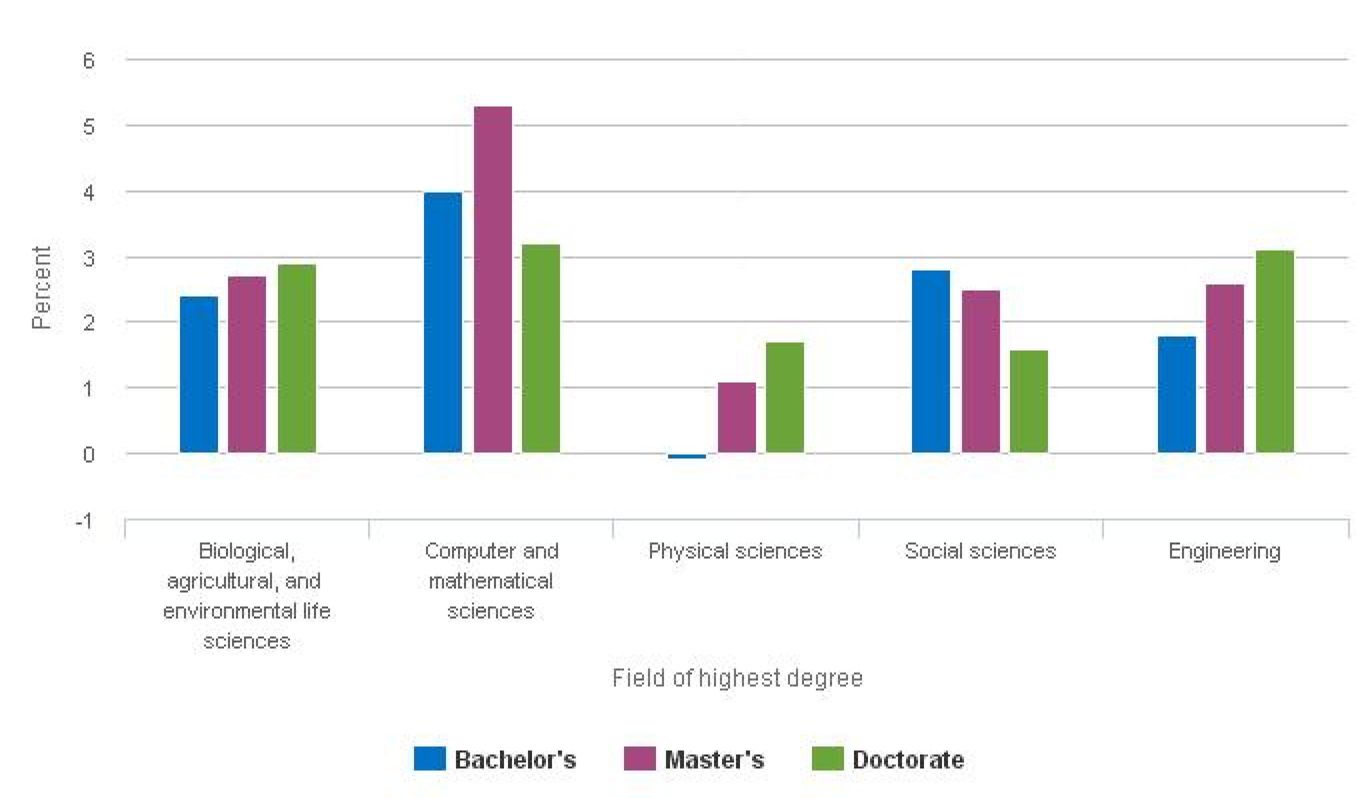
Data from recent years indicate that trends in S&E employment compared favorably to overall employment trends during and after the 2007–09 economic downturn. Occupation-based estimates from BLS indicate that the size of the S&E workforce stayed relatively steady between May 2008 (5.8 million) and May 2011 (5.8 million) and then rose to 6.3 million by May 2014. The broader STEM workforce—including S&E technicians and managers—by May 2014 (8.2 million) had surpassed its previous 2008 (7.9 million) high. In contrast, the total workforce declined from 135 million in May 2008 to 128 million in May 2011 and then rose to 135 million by May 2014, similar to the 2008 level.

The growth in the number of individuals with S&E degrees in recent years can be examined using data from SESTAT. The total number of S&E highest degree holders employed in the United States grew from 9.6 million to 12.4 million between 2003 and 2013, reflecting a 2.7% annual average growth rate. Most broad S&E degree fields exhibited growth (Figure 3-4). (See chapter 2 for a fuller discussion of S&E degrees.)

Figure 3-4

Average annual growth in the total number of employed individuals with highest degree in S&E, by field and level of highest degree: 2003–13



SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Science and Engineering Statistical Data System (SESTAT) (2003, 2013), http://sestat.nsf.gov.

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A number of factors have contributed to the growth in the S&E labor force over time: the rising demand for S&E skills in a global and highly technological economic landscape; increases in U.S. S&E degrees earned by women, by racial and ethnic minority groups, and by foreign-born individuals; temporary and permanent migration to the United States of those with foreign S&E educations; and the rising number of scientists and engineers who are delaying their retirement. The demographic sections of this chapter provide data on aging and retirement patterns of scientists and engineers as well as on S&E participation by women, by racial and ethnic minorities, and by foreign-born individuals.

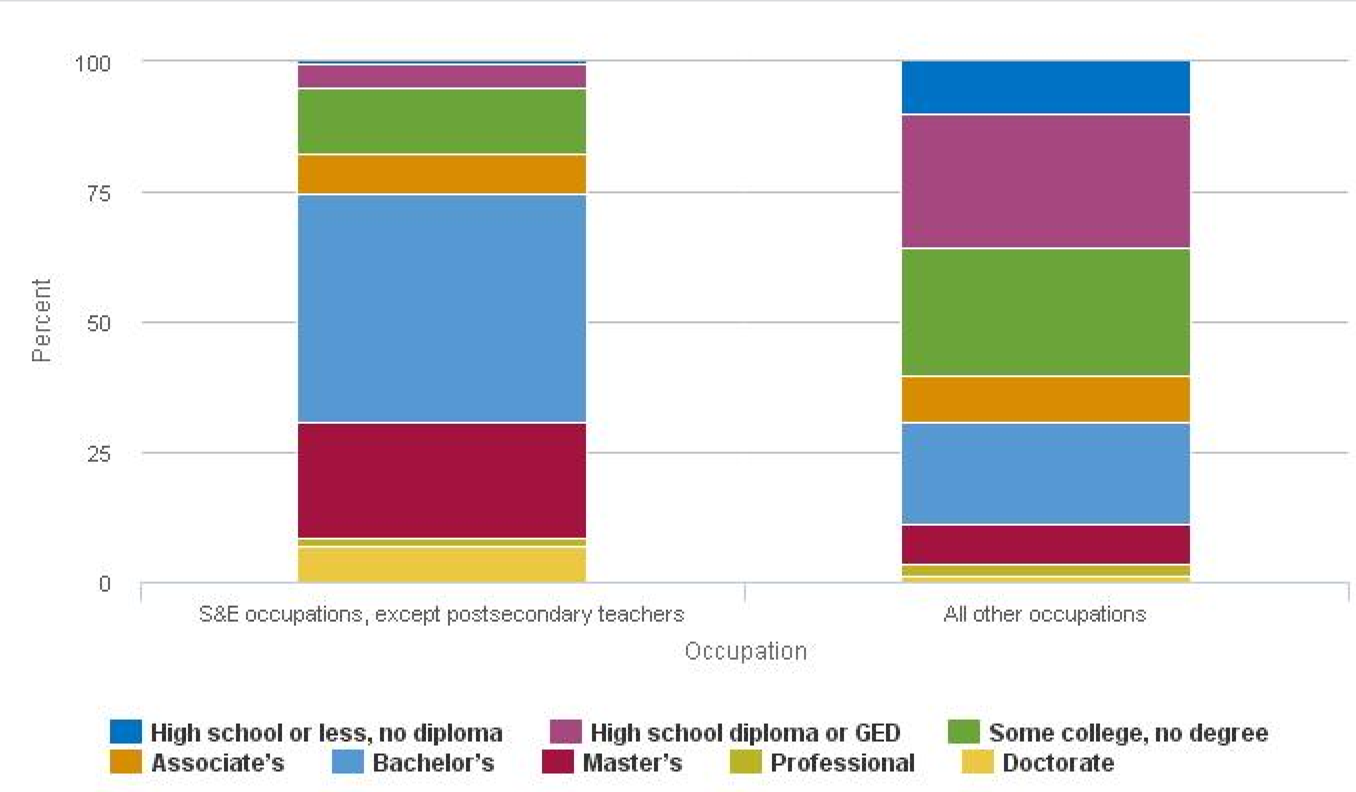
Educational Distribution of Workers in S&E Occupations

Workers in S&E occupations have undergone more formal training than the general workforce (Figure 3-5). Data from the 2013 ACS indicate that a larger proportion of workers in S&E occupations (75%) (excluding postsecondary teachers) hold a bachelor's or higher degree than workers in all other occupations (31%).[i] The proportion of workers with advanced degrees beyond the bachelor's level is 31% in S&E occupations, compared to 11% in all other occupations. About 7% of all S&E workers (again excluding postsecondary teachers) have doctorates.

[i] Many comparisons using Census Bureau data on occupations are limited to looking at all S&E occupations except postsecondary teachers because the Census Bureau aggregates all postsecondary teachers into one occupation code. NSF surveys of scientists and engineers and some BLS surveys collect data on postsecondary teachers by field.

Figure 3-5

Educational attainment, by type of occupation: 2013



GED = General Equivalency Diploma.

SOURCE: Census Bureau, American Community Survey (2013).

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Compared with the rest of the workforce, very few of those employed in S&E occupations have only a high school degree. However, many individuals enter the S&E workforce with marketable technical skills from technical or vocational schools (with or without an earned associate's degree) or college courses; some also acquire these skills through workforce experience or on-the-job training. In information technology, and to some extent in other occupations, employers frequently use certification exams, not formal degrees, to judge skills. (See sidebar, S&E Workers Without a Bachelor's Degree and the discussion on community college in chapter 2 section "Institutions Providing S&E Education".)

S&E Workers Without a Bachelor's Degree

Although the Scientists and Engineers Statistical Data System (SESTAT) provides detailed information on college graduate scientists and engineers, it lacks similar data on individuals who do not have a bachelor's degree. In 2013, about 5.7 million workers age 25 and older without a bachelor's degree were employed in an S&E or S&E-related occupation. Using nationally representative data from the Census Bureau's American Community Survey (ACS), this sidebar looks at the demographic, employment, and educational backgrounds of workers without a bachelor's degree.*

In 2013, about one-quarter of all S&E jobs (1.4 million) and 41% of all S&E-related jobs (4.3 million) were held by individuals without a bachelor's degree. Relative to college-educated workers in S&E or S&E-related occupations, disproportionate numbers of those without a bachelor's degree were black or Hispanic. In 2013, about 12% of sub-baccalaureate workers in these occupations were black, 10% were Hispanic, and 4% were Asian. About 11% of sub-baccalaureate workers in these occupations were foreign born. The corresponding shares among college-educated workers in these occupations were 6% black, 5% Hispanic, 16% Asian, and 23% foreign born.

Among the 1.4 million workers without a bachelor's degree and employed in S&E occupations, 71% were concentrated in computer occupations; computer support specialists accounted for the largest subset (30%) of these workers. In comparison, 46% of the college-educated workers in S&E occupations held computer jobs; software developers represented the largest subset (42%) of these workers.

Health occupations accounted for the largest subset of workers in S&E-related occupations (74%). However, workers without a bachelor's degree were concentrated in different categories of health occupations than those with a bachelor's degree. For example, about 56% of health workers without a college degree were employed as a health technician or technologist; only 12% of health workers with a college degree were employed in these occupations. On the contrary, a similar proportion of health workers with (and without) a bachelor's degree were employed as registered nurses (34% and 37%, respectively).

Relative to other occupations, S&E and S&E-related occupations provide sound employment for workers without a college degree. In 2013, the median earnings of sub-baccalaureate workers in S&E ($60,000) or S&E-related ($45,000) occupations were significantly higher than the median earnings in other occupations ($28,000). The unemployment rate among these workers in S&E (4%) or S&E-related (4%) occupations was lower than the rate in other occupations (9%). Among sub-baccalaureate workers in S&E or S&E-related occupations, median salaries ranged from about $35,000 among health care technicians and technologists to $50,000 among S&E technicians, $52,000 among registered nurses, and $57,000 among computer workers; the unemployment rate ranged from 2% among registered nurses to 4% among health care technicians and 5% among computer workers.

Workers employed in S&E or S&E-related occupations received more formal training (even if they did not have a bachelor's degree) than those employed in other occupations; therefore, it is not surprising that salaries were higher in these jobs. Among workers without a bachelor's degree, 70% of those employed in S&E occupations and 74% of those employed in S&E-related occupations had an associate's degree or 1 or more years of college credit, compared to 36% of those employed in other occupations.

*This sidebar defines the S&E workforce by workers in S&E occupations (except postsecondary teachers in S&E fields). The ACS data do not allow for separate identification of postsecondary teachers by fields. See Appendix Table 3-1 for a list of S&E occupations in the 2013 ACS.

According to the 2013 SESTAT, the vast majority (82%) of college graduates employed in S&E occupations have at least a bachelor's or higher level degree in an S&E field (Table 3-4), suggesting that formal S&E training is the usual pathway for obtaining employment in these occupations. However, the importance of formal S&E training in the same broad field as one's S&E occupation varies across occupational categories. For example, among computer and mathematical scientists, less than one-half (46%) have a bachelor's or higher level degree in that broad field of study and nearly one-fourth (23%) do not have any S&E or S&E-related degree. In contrast, 75% of life scientists, 73% of physical scientists, 75% of social scientists, and 82% of engineers have a bachelor's or higher level degree in their respective broad field. The next section presents data on the proportion of S&E degree holders who are employed in S&E and non-S&E occupational categories.

Table 3-4 **Educational background of college graduates employed in S&E occupations, by broad S&E occupational category: 2013**

(Percent)

Educational background	All S&E occupations	Biological, agricultural, and environmental life scientists	Computer and mathematical scientists	Physical scientists	Social scientists	Engineers
Total (*n*)	5,749,000	638,000	2,647,000	319,000	581,000	1,564,000
At least one S&E degree	82.1	89.3	73.3	96.6	81.6	91.2
At least one S&E degree in field	82.1	75.1	46.1	73.4	75.2	81.5
Highest degree in field	75.5	68.5	42.3	67.4	65.4	74.5
All degrees in S&E	70.7	75.1	63.8	88.1	55.4	82.6
No S&E degrees but at least one S&E-related degree	4.3	6.3	4.3	1.6	2.9	4.5
No S&E or S&E-related degree but at least one non-S&E degree	13.7	4.5	22.5	1.9	15.5	4.3

NOTES: At least one S&E degree in field is the proportion of workers in a particular S&E occupational category with at least one bachelor's or higher-level degree in the same broad field. Highest degree in field is the proportion of workers in a particular S&E occupational category with highest degree in the same broad field. For example, among computer and mathematical scientists, these data refer to the proportion with at least one bachelor's or higher-level degree in the broad field of computer and mathematical sciences and the proportion with highest degree in the broad field of computer and mathematical sciences, respectively. Detail may not add to total because of rounding.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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Occupational Distribution of S&E Degree Holders and Relationship between Jobs and Degrees

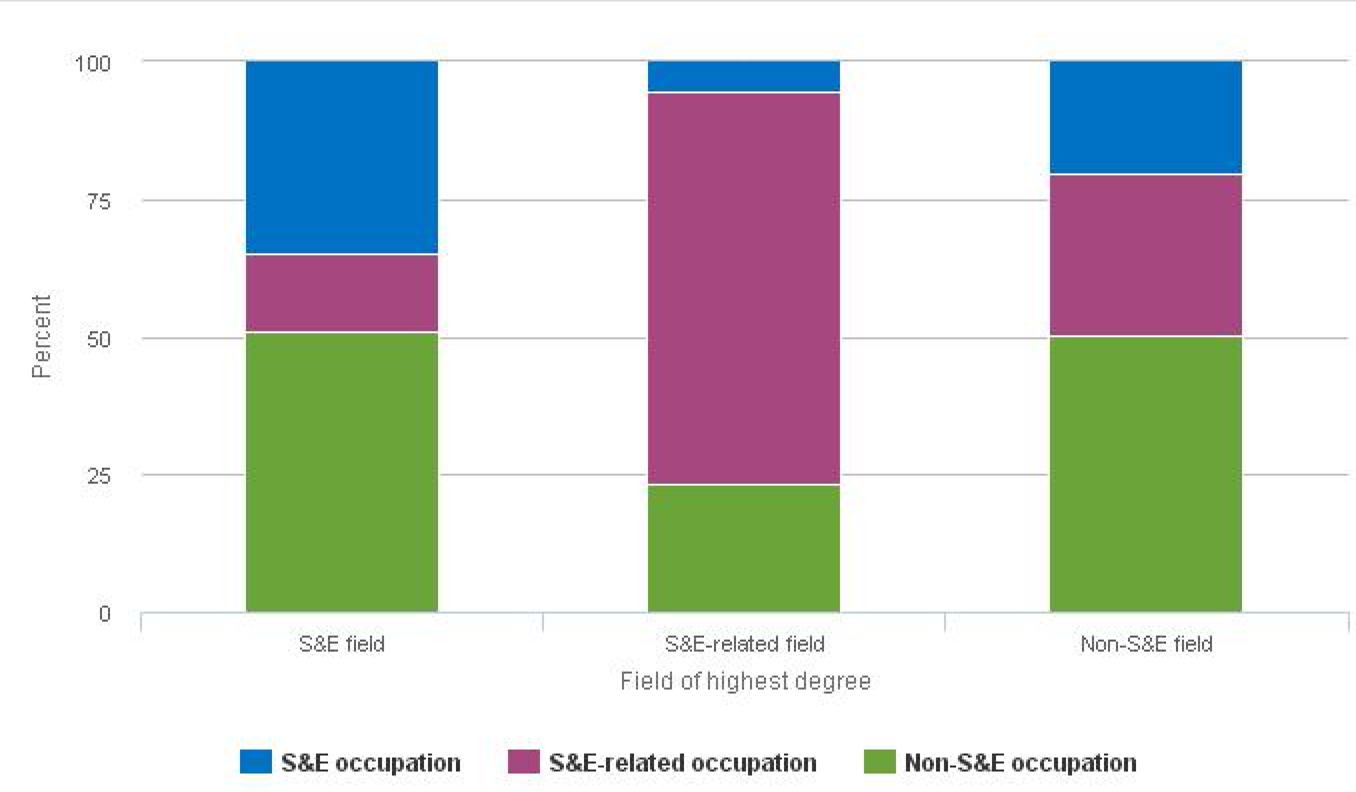
SESTAT provides joint information on both degree achievement and occupational employment of scientists and engineers in the United States, thus enabling a direct comparison of the interplay between degree and occupation for individuals who earned a highest degree in an S&E discipline and those who earned a highest degree in a non-S&E discipline.

Although an S&E degree is often necessary to obtain S&E employment, many individuals with S&E degrees pursue careers in non-S&E fields. However, a majority of workers with S&E training who work in non-S&E jobs reported that their work is related to their S&E training, suggesting that the application of S&E skills and expertise extends well beyond jobs formally classified as S&E occupations. (The next section, "S&E Workers in the Economy," provides data on R&D activity of scientists and engineers employed in S&E and non-S&E occupations.)

Only about half of those with a highest degree in S&E are employed in an S&E (35%) or S&E-related (14%) occupation; the other 51% are employed in non-S&E occupations. Figure 3-6 shows the occupational distribution of the S&E workforce with S&E, S&E-related, and non-S&E highest degrees. The largest category of non-S&E jobs for these S&E degree holders is management and management-related occupations (2.2 million workers), followed by sales and marketing (1.1 million workers) (Appendix Table 3-3). Other non-S&E occupations with a large number of S&E-trained workers include social services (457,000) and college and precollege teaching in non-S&E areas (421,000). S&E degree holders also work in S&E-related jobs such as health (558,000), S&E management (450,000), S&E technician or technologist (501,000), and precollege teaching in S&E areas (219,000).

Figure 3-6

Occupational distribution of scientists and engineers, by broad field of highest degree: 2013



NOTE: Scientists and engineers include those with one or more S&E or S&E-related degrees at the bachelor's level or higher or those who have only a non-S&E degree at the bachelor's level or higher and are employed in an S&E or S&E-related occupation.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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Most individuals with a highest degree in S&E but working in non-S&E occupations do not see S&E as irrelevant. Rather, most indicate that their jobs are either closely (35%) or somewhat (33%) related to their highest degree field (Table 3-5). For example, among S&E degree holders in non-S&E management and management-related occupations, about three-quarters indicate that their jobs are either closely (32%) or somewhat (42%) related to their S&E degree. Among those in social services and related occupations, these numbers are higher (92%); among those in sales and marketing, these numbers are lower (51%).

Table 3-5 **Relationship of highest degree to job among S&E highest degree holders not in S&E occupations, by degree level: 2013**

		Degree related to job (%)		
Highest degree	Workers (*n*)	Closely	Somewhat	Not
All degree levels	8,105,000	34.7	32.9	32.4

		Degree related to job (%)		
Highest degree	Workers (*n*)	Closely	Somewhat	Not
Bachelor's	6,451,000	30.0	34.3	35.7
Master's	1,405,000	54.4	25.8	19.8
Doctorate	232,000	47.0	35.8	17.2

NOTE: All degree levels includes professional degrees not broken out separately. Detail may not add to total because of rounding.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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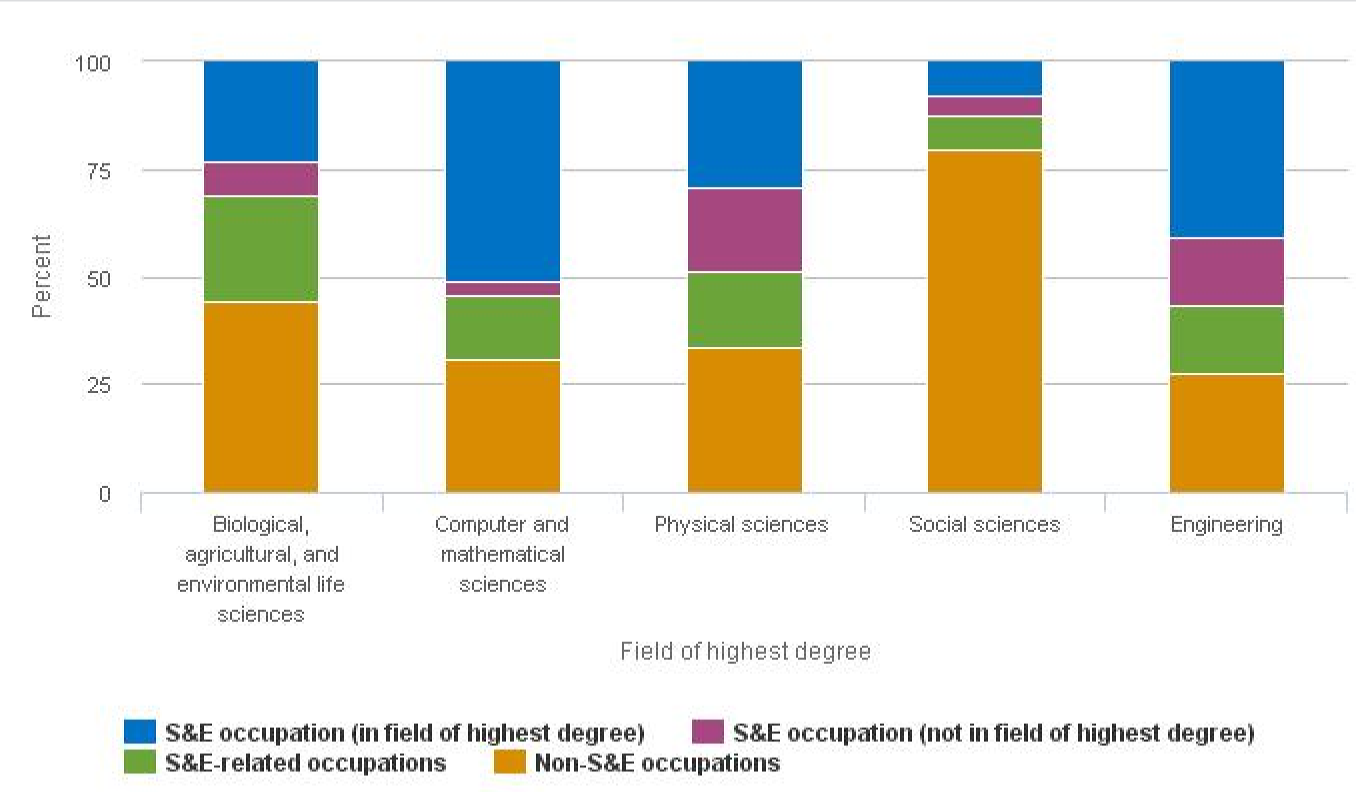
Unlike individuals with an S&E highest degree, at least half of those whose highest degrees are either in S&E-related or non-S&E fields are employed in their corresponding broad occupational categories (Figure 3-6). For those with an S&E-related highest degree, the largest category of jobs is health occupations (3.4 million); for those with a non-S&E highest degree, the largest category of jobs is non-S&E management and management-related occupations (873,000) (Appendix Table 3-3). Significant numbers of individuals with a non-S&E highest degree work in computer and information sciences (671,000), in health (590,000), in precollege teaching in S&E areas (556,000), or as lawyers or judges (562,000).

The pattern that a large proportion of individuals with a highest degree in S&E are employed in areas other than S&E occupations has been robust over time. SESTAT data from 1993 indicate that 36% of all scientists and engineers with S&E highest degrees were employed in S&E occupations, and the rest held positions in areas other than S&E. The comparable proportion in 2013 was 35%.

The proportion of S&E highest degree holders who go on to work in S&E occupations varies substantially by S&E degree fields and levels of degree and is heavily influenced by those in social sciences. Individuals with social sciences degrees are the least likely to work in S&E occupations (12%); these individuals work primarily in non-S&E occupations (80%) (Figure 3-7). In contrast, at least half of individuals with a highest degree in computer and mathematical sciences (54%), physical sciences (49%), or engineering (57%) report working in S&E occupations. This general pattern between study field of degrees and occupations is similar at the bachelor's and master's level but not at the doctoral level, where S&E doctorates most often work in an S&E occupation similar to their doctoral field (Figure 3-8).

Figure 3-7

Occupational distribution of S&E highest degree holders, by field of highest degree: 2013



NOTES: Detail may not add to total because of rounding. For each broad S&E highest degree field, S&E occupation (in field of highest degree) includes individuals who report being employed in an occupation in the same broad category. For example, for highest degree holders in computer and mathematical sciences, S&E occupation (in field of highest degree) includes those who report the broad field of computer and mathematical sciences as their occupation, and S&E occupation (not in field of highest degree) includes those who report an S&E occupation other than computer and mathematical sciences occupations.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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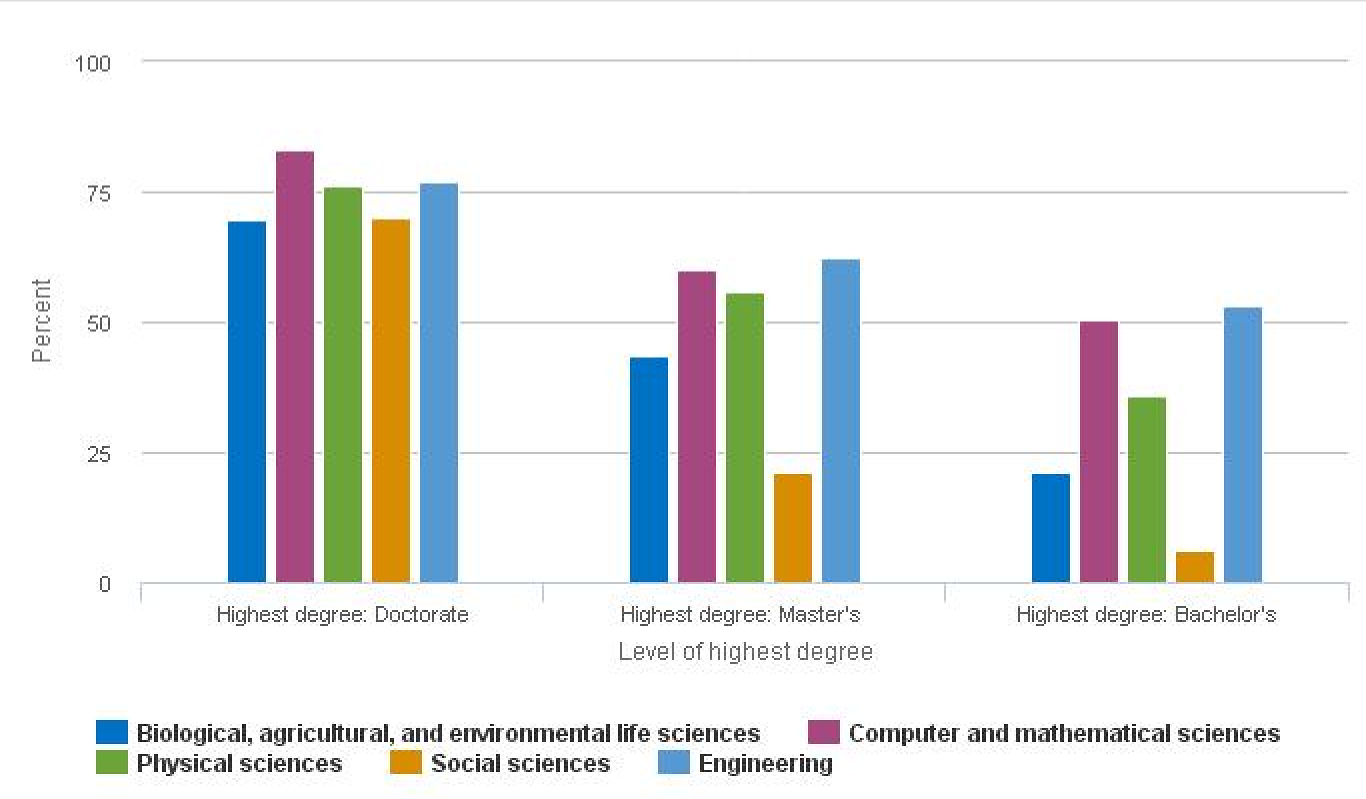
Figure 3-8

S&E degree holders working in S&E occupations, by level and field of S&E highest degree: 2013



NOTE: Individuals may have degrees in more than one S&E degree field.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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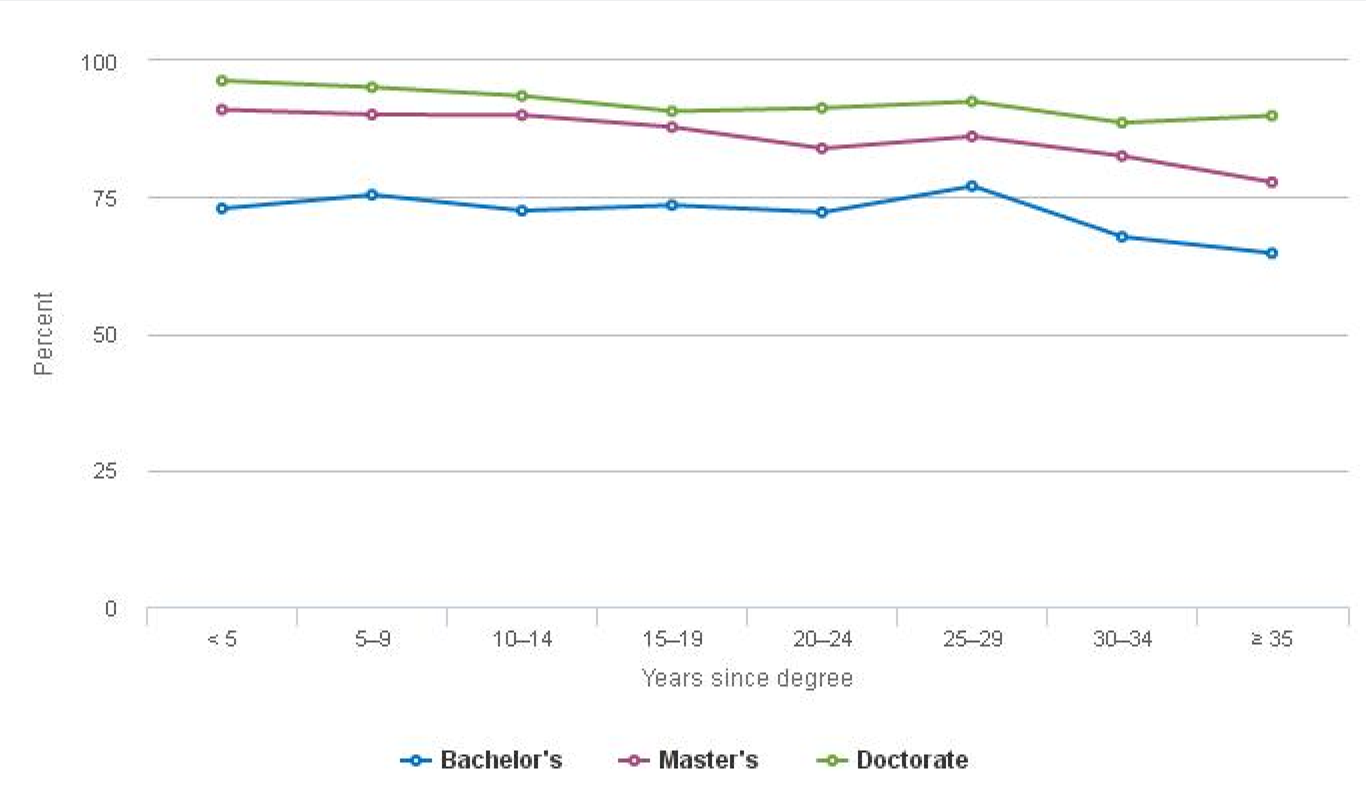
Whereas Figure 3-8 shows the proportion of S&E degree holders employed in S&E occupations, Figure 3-9 shows what proportions of S&E degree holders reported that their work is related (closely or somewhat) to their S&E degree. Workers with more advanced S&E training were more likely than those with only bachelor's level degrees to work in a job related to their degree field. Irrespective of degree level, the bulk of degree holders in life sciences (74%), physical sciences (78%), and computer and mathematical sciences (88%), along with engineering (88%), considered their jobs to be related to their degree field. The corresponding percentage of social scientists was 66%.

Figure 3-9

S&E degree holders employed in jobs related to highest degree, by level of and years since highest degree: 2013



NOTE: Data include those who report their job is either closely or somewhat related to the field of their highest degree.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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The pattern of a stronger relationship between S&E jobs and S&E degrees among master's degree or doctorate holders compared with bachelor's degree holders is robust across career stages, as seen in comparisons among groups of bachelor's, master's, and doctoral degree holders at comparable numbers of years since receiving their degrees (Figure 3-9). For each group, the relationship between job and field of highest degree becomes weaker over time, particularly toward the later career stages. Possible reasons for this decline include changes in career interests, development of skills in different areas, promotion to general management positions, or realization that some of the original training has become obsolete. Despite these potential factors, the career-cycle decline in the relevance of an S&E degree appears modest.

S&E Workers in the Economy

To understand the economic and scientific contributions of scientists and engineers, it is important to know how they are distributed across the economy and what kind of work they perform. This section examines the economic sectors, size, and other characteristics of organizations that employ scientists and engineers (defined both by occupation and field of education). It also describes the distribution of S&E workers within particular sectors. The analysis covers all sectors: private and public educational institutions; for-profit businesses and nonprofit organizations; and federal, state, and local governments. It also examines self-employed scientists and engineers and the concentration of S&E workers by industry sectors and by geography.

The S&E labor force is a national resource in the continuous productivity increases and innovative capacities that fuel long-term economic growth and raise public welfare. The chapter concludes with examinations of R&D activity and work-related training as indicators of worker skill level, productivity, and innovative capacity. It distinguishes between analyses based on S&E degree field and S&E occupation.

Employment Sectors

The business sector is by far the largest employer of the broad S&E workforce (including those with at least an S&E or S&E-related bachelor's degree and those working in an S&E or S&E-related occupation regardless of an S&E degree). In 2013, the business sector—mostly for-profit businesses—employed about 70% of such individuals (Table 3-6). The education sector, including private and public institutions, employed another 19%, the bulk in 2-year and precollege institutions. The government sector—federal, state, and local—employed another 11%. This distribution pattern has been quite stable for decades, except a small rise in the nonprofit segment and a small decline in government (Appendix Table 3-4).

Table 3-6 **Employment sector of scientists and engineers, by broad occupational category and degree field: 2013**

Employment sector	All employed scientists and engineers	Highest degree in S&E	S&E occupations	S&E-related occupations	Non-S&E occupations
Total (*n*)	23,557,000	12,446,000	5,749,000	7,439,000	10,368,000
Business/industry (%)	70.1	71.9	69.7	68.8	71.1
For-profit businesses	52.4	58.2	61.6	45.3	52.4
Nonprofit organizations	11.1	7.2	4.8	18.5	9.2
Self-employed, unincorporated businesses	6.6	6.4	3.3	5.0	9.5
Education (%)	18.9	15.6	18.1	22.6	16.8
4-year institutions	7.9	8.3	14.5	7.2	4.8
2-year and precollege institutions	11.0	7.3	3.7	15.4	12.0
Government (%)	11.0	12.5	12.2	8.6	12.1

Employment sector	All employed scientists and engineers	Highest degree in S&E	S&E occupations	S&E-related occupations	Non-S&E occupations
Federal	4.3	5.1	6.4	3.3	4.0
State/local	6.7	7.4	5.8	5.3	8.1

NOTE: Scientists and engineers include those with one or more S&E or S&E-related degrees at the bachelor's level or higher or those who have only a non-S&E degree at the bachelor's level or higher and are employed in an S&E or S&E-related occupation.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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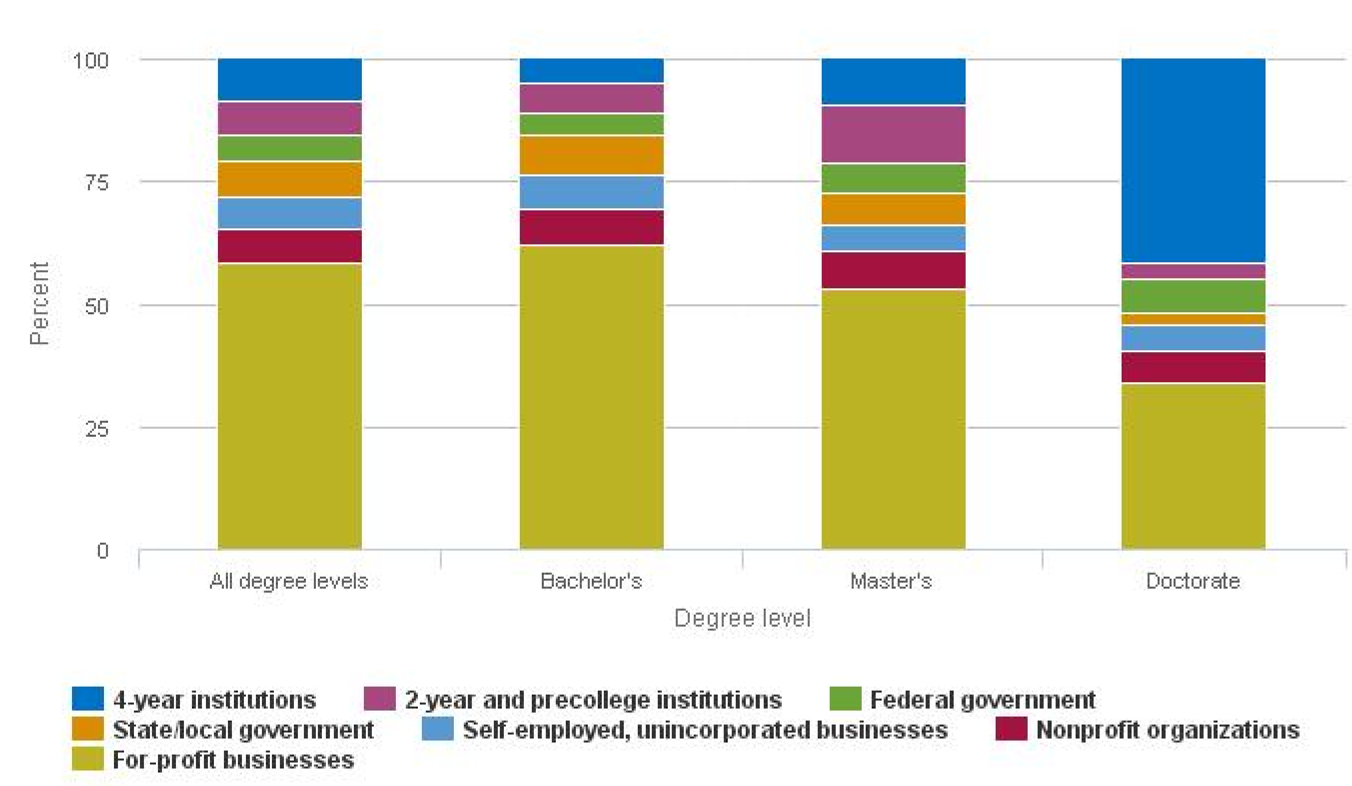
Some differences exist in the concentration of particular groups of S&E workers across employment sectors. For example, academic institutions are the largest employer of the SESTAT population with doctorates, although the business sector is the largest employer of the overall SESTAT population. Whereas individuals employed in engineering occupations and computer and mathematical sciences occupations are largely concentrated in the business sector, those employed as life scientists, physical scientists, and social scientists are more evenly distributed between the business and education sectors. The following discussion provides a deeper analysis of the economic sectors in which scientists and engineers work.

Education Sector

The education sector employs nearly one-fifth of the S&E workforce but is segmented by level of S&E education (Table 3-6). The vast majority of S&E doctorate holders in this sector work in 4-year institutions as faculty, postdocs, research staff, and a variety of other full- and part-time positions. The majority of bachelor’s level scientists and engineers work in 2-year and precollege institutions (Figure 3-10; Appendix Table 3-5). (See chapter 5 for additional detail on academic employment of science, engineering, and health [SEH] doctorates.)

Figure 3-10

S&E highest degree holders, by degree level and employment sector: 2013



NOTE: All degree levels includes professional degrees not reported separately.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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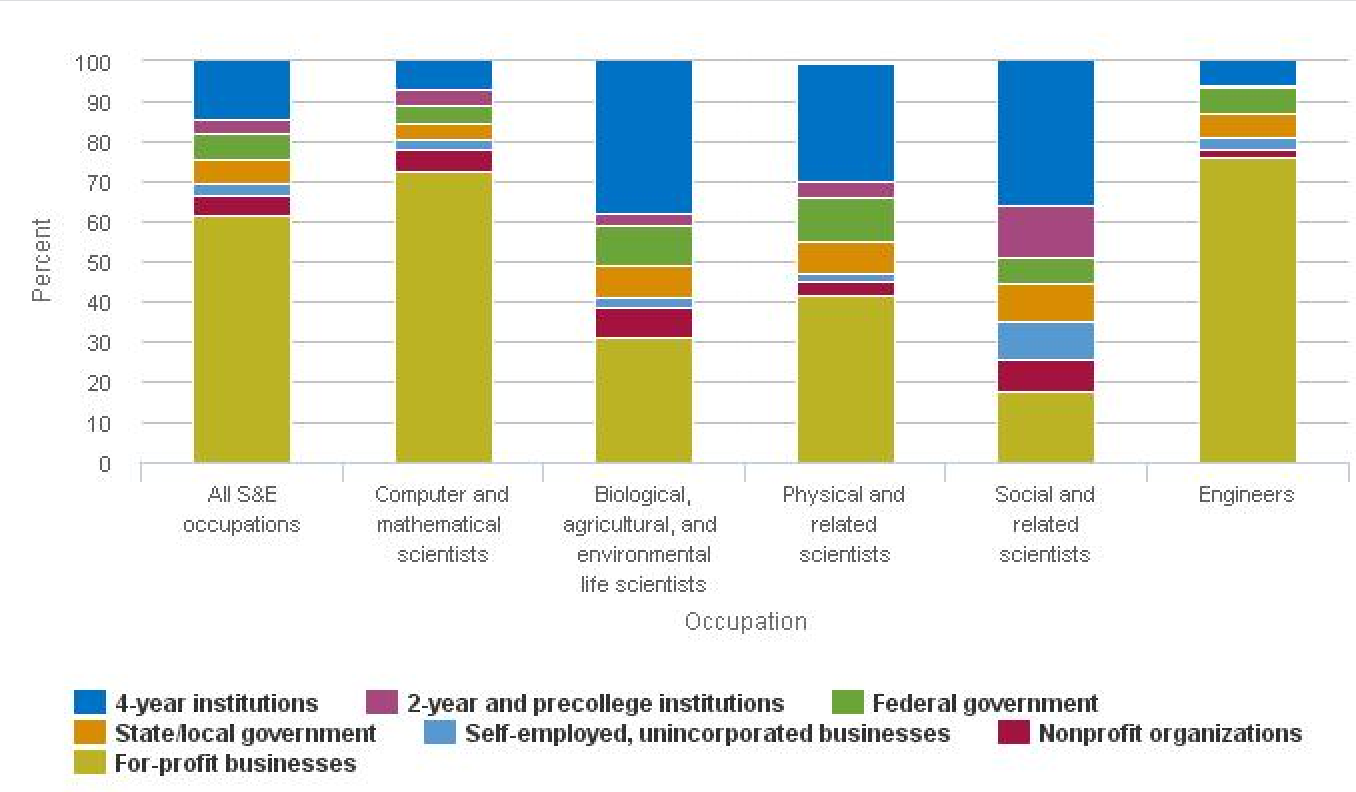
The subsectoral employment distribution also differs for those in S&E occupations. Larger proportions of life, physical, and social scientists work in the education sector compared with engineers or computer and mathematical scientists (Figure 3-11). Within the education sector, the vast majority (80%) of those in S&E occupations are concentrated in 4-year institutions. In contrast, the great majority of workers in S&E-related or non-S&E occupations in the education sector are found in 2-year and precollege institutions (68% and 71%, respectively), and the bulk of them are employed as teachers.

Figure 3-11

Broad S&E occupational categories, by employment sector: 2013



SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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Business Sector

For-profit businesses. For-profit businesses employ the largest proportion of scientists and engineers (Table 3-6). At the doctorate level, however, for-profit businesses employ fewer S&E doctorates than 4-year educational institutions (Figure 3-10; Appendix Table 3-5). About three-fourths of those working in computer and mathematical sciences occupations (73%) and in engineering occupations (76%) are employed by for-profit businesses, but the proportions are much lower for those in other S&E occupations, ranging from 17% for social scientists to 41% for physical scientists (Figure 3-11).

Nonprofit organizations. Employment of scientists and engineers in nonprofit organizations has grown (Appendix Table 3-4), with particularly strong growth among S&E-related occupations, which include health-related jobs. Continuing the trend seen in the broader economy, the number of health-related jobs in nonprofit organizations has risen dramatically from 97,000 in 1993 to 1.2 million in 2013. As a result, the total share of all health-related occupations in nonprofit organizations has risen from 13% in 1993 to 27% in 2013. The majority of such workers are employed as registered nurses, dieticians, therapists, physician assistants, and nurse practitioners.

Among those in S&E occupations, the proportion employed by nonprofit organizations is much smaller (5%) (Table 3-6), with substantial variation among different fields, ranging from 2% of engineers to 8% of social scientists and life scientists (Figure 3-11).

Self-employment. In 2013, almost 4.1 million scientists and engineers (17%) reported being self-employed in either an unincorporated or incorporated business, professional practice, or farm (Table 3-7).[i] Those working in S&E-related or non-S&E occupations reported higher levels of self-employment (16% and 22%, respectively) than those working in S&E occupations (11%). Among those with a highest degree in S&E, individuals with professional degrees reported substantially higher rates of self-employment (38%) than those with a bachelor's degree (18%), master's degree (14%), or doctorate (11%) as their highest degree.

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[i] The data on self-employment from SESTAT include those who report being self-employed or employed by a business owner in either an unincorporated or incorporated business, professional practice, or farm. As a result, the data may capture both self-employed individuals in their own businesses as well as those whose principal employer is a business owner. This is a major reason why the SESTAT estimate of self-employed workers in S&E occupations is higher than those from other surveys (e.g., the Census Bureau's ACS).

Table 3-7 **Self-employed scientists and engineers, by education, occupation, and type of business: 2013**

(Percent)

Characteristic	Total	Unincorporated business	Incorporated business
All employed scientists and engineers	17.4	6.6	10.9
Highest degree in S&E field	16.8	6.4	10.3
Biological, agricultural, and environmental life sciences	18.6	7.5	11.1
Computer and mathematical sciences	13.4	4.6	8.7
Physical sciences	14.6	5.7	8.9
Social sciences	18.4	8.2	10.1
Engineering	16.1	4.3	11.8
S&E highest degree level			
Bachelor's	18.1	6.8	11.4
Master's	13.9	5.5	8.4
Doctorate	10.8	5.3	5.5
Professional	37.8	24.4	13.3
Occupation			
S&E occupation	10.7	3.3	7.3
Biological, agricultural, and environmental life scientists	5.8	2.2	3.8
Computer and mathematical scientists	10.3	2.9	7.5
Physical scientists	7.8	2.2	5.3
Social scientists	15.5	9.5	6.0

Characteristic	Total	Unincorporated business	Incorporated business
Engineers	12.0	2.6	9.5
S&E-related occupations	15.7	5.0	10.7
Non-S&E occupations	22.4	9.5	12.9

NOTE: Scientists and engineers include those with one or more S&E or S&E-related degrees at the bachelor's level or higher or those who have only a non-S&E degree at the bachelor's level or higher and are employed in an S&E or S&E-related occupation.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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Incorporated businesses account for at least half of self-employed scientists and engineers in most fields. However, most of those whose highest degree was a professional one worked in unincorporated businesses (Table 3-7). This was also the case for individuals in social sciences occupations, whose level of unincorporated self-employment was largely driven by psychologists: In 2013, among the 208,000 employed psychologists, 31% were self-employed, mostly in unincorporated businesses. In addition, 38% of professional degree holders in a field of psychology were self-employed, divided almost evenly between unincorporated and incorporated businesses.

Government Sector

Federal government. According to data from the U.S. Office of Personnel Management (OPM), in 2014 the federal government employed approximately 319,000 people in S&E occupations, which represents about 16% of the federal civilian workforce.[ii],[iii] Federal workers in S&E occupations are almost evenly distributed among computer and mathematical sciences occupations (32%); engineering occupations (31%); and life sciences, physical sciences, and social sciences occupations (36%). The vast majority (81%) of the federal workers in S&E occupations have a bachelor's or higher level degree.

The five federal agencies with the largest proportions of their workforce in S&E jobs are those with strong scientific missions: the National Aeronautics and Space Administration (65%), the Nuclear Regulatory Commission (62%), the Environmental Protection Agency (61%), NSF (41%), and the Department of Energy (33%). The Department of Defense has the largest number of workers in S&E occupations (147,000), accounting for 46% of the federal workforce in S&E occupations.[iv]

State and local government. In 2013, about 1.6 million scientists and engineers (7%) were working in state and local governments in the United States (Table 3-6). Public educational institutions are included in the education sector and excluded here. State and local governments employ about 8% of S&E bachelor's degree holders and 7% of S&E master's degree holders, compared to only 2% of S&E doctorate holders (Figure 3-10). Among those employed in S&E occupations, larger proportions of life scientists, physical scientists, and social scientists work in state and local governments compared with engineers and computer and mathematical scientists (Figure 3-11).

[ii] The source of the federal S&E employment data is OPM's Enterprise Human Resources Integration Statistical Data Mart. Coverage is limited to federal civilian employees on pay status with certain exclusions. For information on specific exclusions and inclusions, see the coverage definition on OPM's Federal Human Resources Data (FedScope) Web page: http://www.fedscope.opm.gov/datadefn/aehri_sdm.asp#cpdf3

[iii] Employment in the federal government is largely limited to those with U.S. citizenship. Many federal workers with S&E employment are in occupations that, nationwide, include relatively large concentrations of foreign-born persons, some of whom are not U.S. citizens, rendering them ineligible for many federal jobs.

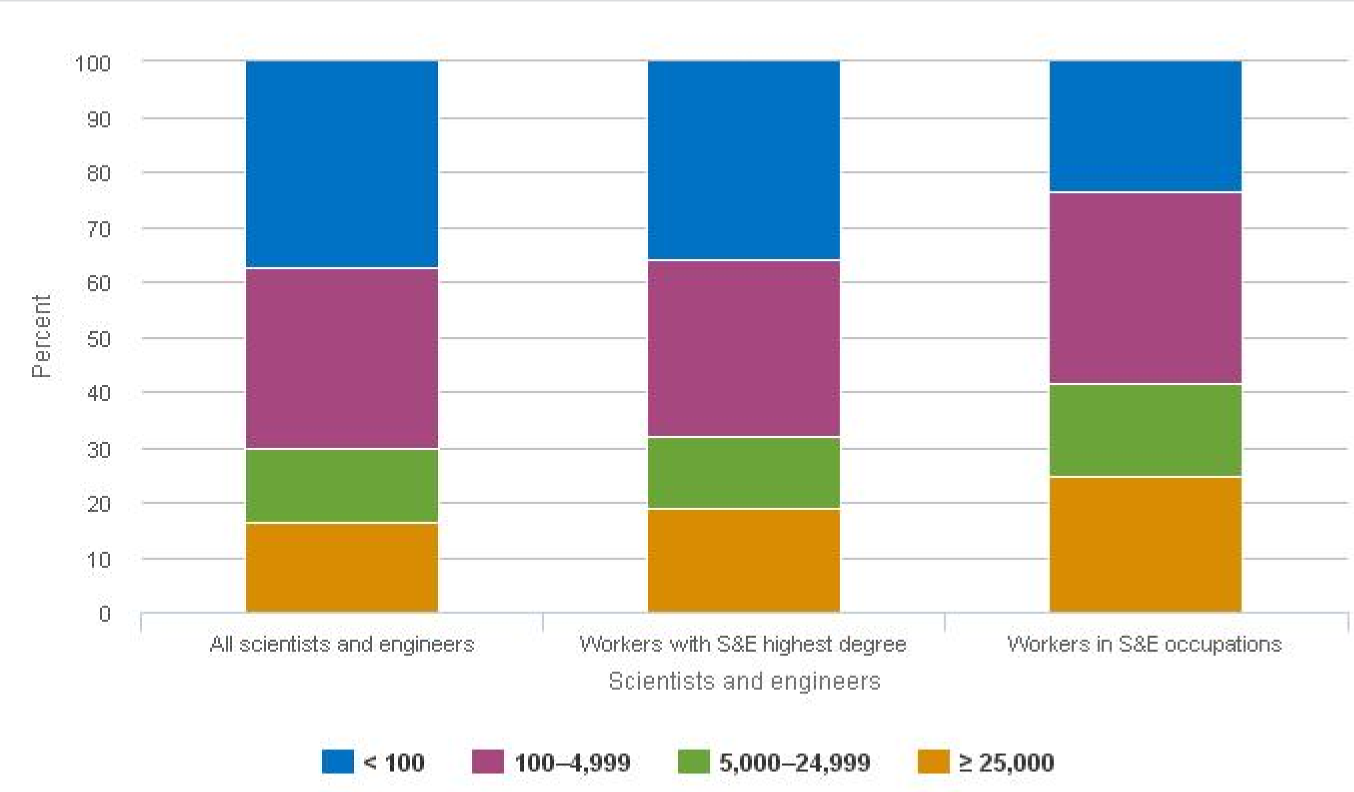
[iv] This list does not include the National Institutes of Health, which is a part of the Department of Health and Human Services (DHHS). S&E employment accounted for 19% of total DHHS employment in 2014.

Employer Size

The vast majority of educational institutions and government entities that employ individuals trained in S&E fields or working in S&E occupations are large employers (i.e., having 100 or more employees). These large organizations employ 87% of scientists and engineers in the education sector and 91% of those in the government sector. In contrast, scientists and engineers working in the business sector are more broadly distributed across firms of different sizes (Figure 3-12).

Figure 3-12

Scientists and engineers employed in the business sector, by employer size: 2013



NOTE: Scientists and engineers include those with one or more S&E or S&E-related degrees at the bachelor's level or higher or those who have only a non-S&E degree at the bachelor's level or higher and are employed in an S&E or S&E-related occupation.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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Many scientists and engineers who are self-employed work in businesses with 10 or fewer employees. In all, 85% of self-employed individuals in unincorporated businesses and 45% of self-employed individuals in incorporated businesses work in businesses with 10 or fewer employees. In contrast, only 5% of all other scientists and engineers work in businesses with 10 or fewer employees. Many of these scientists and engineers likely think of themselves as independent professionals rather than small business owners.

Industry Employment

The OES survey provides detailed estimates for employment in S&E occupations by type of industry; however, it excludes self-employed individuals, those employed in private households, and some individuals employed in agriculture. Industries vary in their proportions of S&E workers (Table 3-8). In 2014, the industry group with the largest S&E employment was professional, scientific, and technical services[i] (2 million), followed by manufacturing (911,000) (Table 3-8). The government sector, which includes federal, state, and local governments, employed 636,000 S&E workers; educational services, including private and public educational institutions, employed another 696,000 S&E workers. These four industry groups—professional, scientific, and technical services; manufacturing;

government; and educational services—had a disproportionate concentration of S&E workers and together accounted for about 67% of S&E employment, compared with 31% of total employment.

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[i] The establishments in this sector provide professional, scientific, and technical services to clients in a variety of industries as well as households. The services provided by S&E workers in this industry sector may include computer services; engineering and specialized design services; consulting services; research services; advertising services; and other professional, scientific, and technical services.

Table 3-8 Employment in S&E occupations, by major industry: May 2014

	Workers employed (*n*)		
Industry	All occupations	S&E occupations	Industry workforce in S&E occupations (%)
U.S. total—all industries	135,128,260	6,318,580	4.7
Agriculture, forestry, fishing, and hunting	409,720	1,250	0.3
Mining	824,260	61,630	7.5
Utilities	547,980	56,560	10.3
Construction	6,094,090	55,930	0.9
Manufacturing	12,100,740	911,290	7.5
Wholesale trade	5,780,070	236,950	4.1
Retail trade	15,472,510	44,210	0.3
Transportation and warehousing	5,202,640	40,590	0.8
Information	2,735,590	507,080	18.5
Finance and insurance	5,618,720	314,930	5.6
Real estate, rental, and leasing	2,017,970	13,470	0.7
Professional, scientific, and technical services	8,231,540	1,972,220	24.0
Management of companies and enterprises	2,206,620	275,840	12.5
Administrative and support and waste management and remediation	8,627,320	236,180	2.7
Educational services	12,758,610	696,180	5.5
Health care and social assistance	18,341,690	199,980	1.1
Arts, entertainment, and recreation	2,198,590	11,570	0.5
Accommodation and food services	12,548,660	3,680	0.0
Other services (except federal, state, and local government)	3,937,990	43,320	1.1
Federal, state, and local government (OES designation)	9,472,980	635,730	6.7

	OES = Occupational Employment Statistics.
NOTES:	Industries are defined by the North American Industry Classification System (NAICS). The OES Survey does not cover employment among self-employed workers and employment in private households (NAICS 814). In the employment total for agriculture, forestry, fishing, and hunting, only the following industries are included: logging (NAICS 1133), support activities for crop production (NAICS 1151), and support activities for animal production (NAICS 1152). As a result, the data do not represent total U.S. employment. Differences between any two industry groups may not be statistically significant.
SOURCE:	Bureau of Labor Statistics, OES Survey (May 2014).
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S&E employment intensity, defined by an industry's S&E employment as a proportion of its total employment, was highest in professional, scientific, and technical services (24%), followed by information (19%) and management of companies and enterprises (13%) (Table 3-8). The broad industry sectors with S&E employment intensity below the national average (4.7%) together employed 60% of all workers in 2014 but only 14% of workers in S&E occupations. These sectors with S&E employment intensity below the national average include large employers such as health care and social assistance, retail trade, and accommodation and food services. The health care and social assistance industry employed a large number of health workers who fall under NSF's category of S&E-related occupations (Table 3-2).

Employment by Metropolitan Area

The availability of a skilled workforce is an important indicator of a region's population, productivity, and technological growth (Carlino, Chatterjee, and Hunt 2001; Glaeser and Saiz 2003). The federal government uses standard definitions to describe geographical regions in the United States for comparative purposes. It designates very large metropolitan areas, sometimes dividing them into smaller metropolitan divisions that can also be substantial in size (Office of Management and Budget 2009).

This section presents the following indicators of the availability of S&E workers in a metropolitan area: (1) the number of S&E workers in the metropolitan area or division, and (2) the proportion of the entire metropolitan area workforce in S&E occupations. Data on the metropolitan areas with the largest proportion of workers in S&E occupations in 2014 appear in Table 3-9. These estimates are affected by the geographic scope of each metropolitan area, which can vary significantly. In particular, comparisons between areas can be strongly affected by how much territory outside the urban core is included in the metropolitan area.

Table 3-9 Metropolitan areas with largest proportion of workers in S&E occupations: May 2014

	Workers employed (*n*)		
Metropolitan area	All occupations	S&E occupations	Metropolitan area workforce in S&E occupations (%)
U.S. total	135,128,260	6,318,580	4.7
San Jose–Sunnyvale–Santa Clara, CA	973,480	163,460	16.8
Boulder, CO	167,200	22,620	13.5
Huntsville, AL	208,480	27,820	13.3
Framingham, MA, NECTA Division	162,170	21,010	13.0
Corvallis, OR	33,450	3,920	11.7

Metropolitan area	Workers employed (*n*)		Metropolitan area workforce in S&E occupations (%)
	All occupations	S&E occupations	
Durham–Chapel Hill, NC	284,480	33,020	11.6
Washington-Arlington-Alexandria, DC-VA-MD-WV, Metropolitan Division	2,378,260	259,080	10.9
Seattle-Bellevue-Everett, WA, Metropolitan Division	1,492,650	154,480	10.3
Bethesda-Rockville-Frederick, MD, Metropolitan Division	566,300	55,860	9.9
San Francisco–San Mateo–Redwood City, CA, Metropolitan Division	1,086,660	105,430	9.7
Ithaca, NY	49,430	4,380	8.9
Ames, IA	42,250	3,740	8.9
Boston-Cambridge-Quincy, MA, NECTA Division	1,795,230	157,300	8.8
Lowell-Billerica-Chelmsford, MA-NH, NECTA Division	118,980	10,420	8.8
Ann Arbor, MI	204,840	17,810	8.7
Columbus, IN	48,120	4,090	8.5
Fort Collins–Loveland, CO	139,530	11,810	8.5
Austin–Round Rock–San Marcos, TX	886,620	72,820	8.2
State College, PA	66,660	5,420	8.1
Madison, WI	347,750	27,250	7.8

NOTES: NECTA = New England City and Town Area.
The data exclude metropolitan statistical areas where S&E proportions were suppressed. Larger metropolitan areas are broken into component metropolitan divisions. Differences between any two areas may not be statistically significant.

SOURCE: Bureau of Labor Statistics, Occupational Employment Statistics Survey (May 2014).

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S&E employment in the United States is geographically concentrated; that is, a small number of geographic areas account for a significant proportion of S&E jobs. For example, the 20 metropolitan areas listed in Table 3-9 account for 18% of nationwide employment in S&E jobs, compared to about 8% of employment in all occupations.

Scientists and Engineers and Innovation-Related Activities

Who Performs R&D?

R&D creates new types of goods and services that can fuel economic and productivity growth and enhance living standards. Thus, the status of the nation's R&D workforce is a policy area of concern nationally, regionally, and, increasingly, locally. This section uses SESTAT data to examine the R&D activity of scientists and engineers. In this section, the R&D workforce is defined as the proportion of workers who reported basic research, applied research, design, or development as a primary or secondary work activity in their principal job (i.e., activities that rank first or second in total work hours from a list of 14 activities).[i]

Overall, 27% of employed scientists and engineers in 2013 reported R&D as a primary or secondary work activity; the proportions who did so vary substantially across occupations and degrees (Figure 3-13). The majority of individuals in S&E occupations (55%) reported performing R&D, but so did a considerable proportion of those in S&E-related occupations (21%) and non-S&E occupations (15%). This indicates that although R&D activity spans a broad range of occupations, it is concentrated in S&E occupations. Among those with a non-S&E highest degree but working in an S&E occupation, a sizeable proportion reported R&D activity (44%), although this proportion is lower than for their colleagues with a highest degree in an S&E field (58%).

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[i] The other 10 activities are used to define four additional broad categories of primary/secondary work activities, including teaching; management and administration; computer applications; and professional services, production workers, or other work activities not specified.

Figure 3-13

Employed scientists and engineers with R&D activity, by broad field of highest degree and broad occupational category: 2013

NOTES: Scientists and engineers include those with one or more S&E or S&E-related degrees at the bachelor's level or higher or those who have only a non-S&E degree at the bachelor's level or higher and are employed in an S&E or S&E-related occupation. R&D activity here refers to the share of workers reporting basic research, applied research, design, or development as a primary or secondary work activity in their principal job—activities ranking first or second in work hours.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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Many S&E degree holders subsequently earn degrees in fields such as medicine, law, or business. In 2013, the majority of S&E bachelor's degree holders who subsequently obtained an advanced degree (60%) earned it in an S&E-related field (18%) or non-S&E field (42%). Additionally, among S&E bachelor's degree holders who reported a second major for their bachelor's degree, about 56% designated an S&E-related field (2%) or non-S&E field (54%) as their second major.

Most individuals in the S&E workforce who reported performing R&D have a bachelor's (54%) or master's (31%) degree as their highest degree; those with doctorates account for 11% of researchers but only 5% of the S&E workforce. In most occupations, those with doctorates indicated higher rates of R&D activity than those with a bachelor's or master's degree as their highest degree (table 3-10).[ii] Overall, among those employed in S&E occupations, life scientists (74%) reported the highest rates of R&D activity, whereas social scientists (47%) and computer and mathematical scientists (44%) reported the lowest rates (Table 3-10).

[ii] Social scientists were exceptions. In 2013, a larger proportion of social scientists with doctorates reported R&D activity than social scientists with master's degrees; however, the difference in R&D activity rates between social scientists with doctorates and social scientists with bachelor's degrees was not statistically significant.

Table 3-10 **R&D activity rate of scientists and engineers employed in S&E occupations, by broad occupational category and level of highest degree: 2013**

(Percent)

Highest degree level	Biological, agricultural, and environmental life scientists	Computer and mathematical scientists	Physical scientists	Social scientists	Engineers
All degree levels	73.8	44.4	69.9	47.0	66.6
Bachelor's	68.9	41.4	60.2	47.6	64.4
Master's	69.6	48.7	72.3	45.0	66.9
Doctorate	83.7	64.5	79.4	54.0	84.7

NOTES: All degree levels includes professional degrees not broken out separately. R&D activity rate is the proportion of workers who report that basic research, applied research, design, or development is a primary or secondary work activity in their principal job—activities ranking first or second in work hours.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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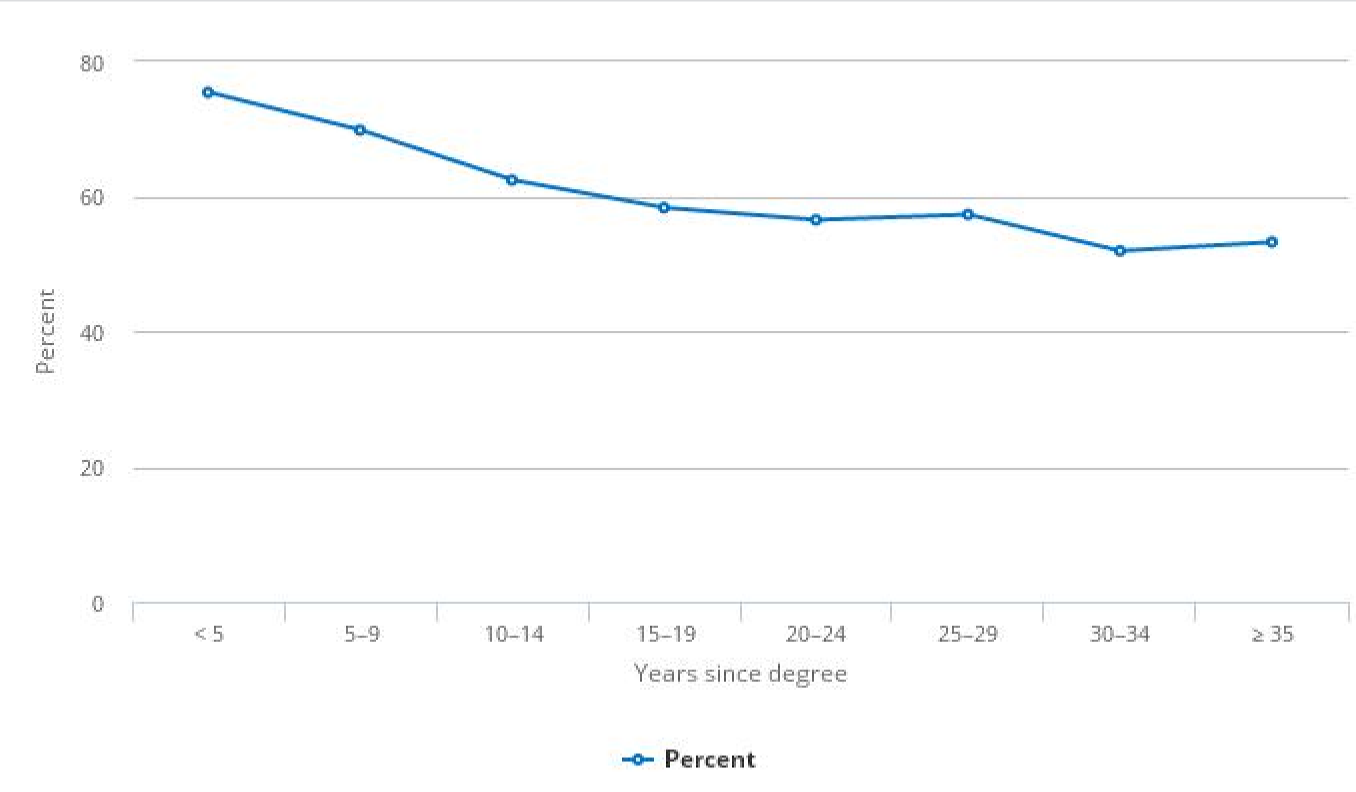
R&D activity tends to decline in later career stages (Figure 3-14). Among S&E doctorate holders who earned their doctorate in 2004 or later, 72% reported R&D activity in 2013. Among those receiving degrees between 1984 and 2003, 59% reported R&D activity in 2013. For those with degrees pre-dating 1984, 53% reported R&D activity in 2013. The decline in R&D activity over the course of individuals' careers may reflect movement into teaching or management, growth of other career interests, or possession of scientific knowledge and skills that are no longer in demand. It may also reflect increased opportunity for more experienced scientists to perform functions involving the interpretation and use of, as opposed to the creation and development of, scientific knowledge.

Figure 3-14

Employed SEH doctorate holders with R&D activity, by years since doctoral degree: 2013



SEH = science, engineering, and health.

NOTE: R&D activity here refers to the share of workers reporting basic research, applied research, design, or development as a primary or secondary work activity in their principal job—activities ranking first or second in work hours.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Doctorate Recipients (SDR) (2013), http://sestat.nsf.gov.

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Work-Related Training

In addition to formal education, workers receive work-related training. Such training can contribute to innovation and productivity growth by enhancing skills, efficiency, and knowledge. In 2013, 54% of scientists and engineers reported participating in work-related training within the past 12 months of being surveyed (Table 3-11).[iii] Among those who were employed, workers in S&E-related jobs (health-related occupations, S&E managers, S&E precollege teachers, and S&E technicians and technologists) exhibited higher rates of training (73%) than workers in S&E (54%) or non-S&E occupations (59%). Women participated in work-related training at a higher rate than men (56% versus 51%) (Appendix Table 3-6). This difference exists regardless of labor force status.

[iii] Work-related training includes conferences and professional meetings only if the conference or meeting attendance also includes attending a training session; it does not include college coursework while enrolled in a degree program.

Table 3-11 **Scientists and engineers participating in work-related training, by labor force status and occupation: 2013**

Labor force status and occupation	Number	Percent
All scientists and engineers	15,482,000	53.5
Employed	14,705,000	62.4
S&E occupations	3,123,000	54.3
Biological, agricultural, and environmental life scientists	352,000	55.2
Computer and mathematical scientists	1,319,000	49.8
Physical scientists	156,000	48.9
Social scientists	367,000	63.2
Engineers	929,000	59.4
S&E-related occupations	5,452,000	73.3
Non-S&E occupations	6,130,000	59.1
Unemployed	259,000	27.8
S&E occupations	50,000	26.6
Biological, agricultural, and environmental life scientists	8,000	36.4
Computer and mathematical scientists	16,000	18.6
Physical and related scientists	6,000	40.0
Social and related scientists	6,000	30.0
Engineers	14,000	31.1
S&E-related occupations	65,000	39.2
Non-S&E occupations	143,000	26.0
Not in labor force	517,000	11.6

NOTES: Scientists and engineers include those with one or more S&E or S&E-related degrees at the bachelor's level or higher or those who have only a non-S&E degree at the bachelor's level or higher and are employed in an S&E or S&E-related occupation in 2013. Unemployed individuals are those not working but who looked for a job in the preceding 4 weeks. For unemployed, the last job held was used for classification. Detail may not add to total because of rounding.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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Among scientists and engineers who participated in such work-related training, most did so to improve skills or knowledge in their current occupational field (53%) (Appendix Table 3-7).[iv] Others did so for licensure /certification in their current occupational field (23%) or because it was required or expected by their employer (15%). Relative to those who were employed or not in the labor force, those who were unemployed more frequently reported that they engaged in work-related training to facilitate a change to a different occupational field. Those who were not in the labor force more frequently reported that they engaged in this activity for leisure or personal interest than those who were in the labor force.

[iv] Although SESTAT respondents were allowed to provide more than one reason for participating in work-related training, the data presented in this section are on the most important reason for participating in such training.

S&E Labor Market Conditions

This section assesses the overall health of the labor market for scientists and engineers. Indicators of labor market participation (such as rates of unemployment and working involuntarily out of one's degree field) and earnings provide meaningful information on economic rewards and the overall attractiveness of careers in S&E fields. Many labor market indicators are lagging indicators, which change some time after other indicators show that the economy has begun to follow a particular trend. For example, although the most recent recession officially began in December 2007 and ended in June 2009, unemployment rates continued to rise after the recession had officially ended.[i] Rates of unemployment, rates of working involuntarily out of one's field of highest degree, and earnings should all be considered in this context.

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[i] The Business Cycle Dating Committee of the National Bureau of Economic Research is generally the source for determining the beginning and end of recessions or expansions in the U.S. economy. See http://www.nber.org/cycles/recessions.html for additional information.

Unemployment

Unemployment among scientists and engineers compares favorably with the rates for the labor force as a whole and for the college-educated labor force. In February 2013, an estimated 3.8% of the broad SESTAT population were unemployed (Appendix Table 3-8); the comparable unemployment rate for the entire U.S. labor force was more than twice as high, 8.1%.[i] The unemployment rate for the entire college-educated labor force in the same period was 4.3%. Although the unemployment rate among scientists and engineers in February 2013 was lower than in October 2010 (4.3%), it continued to exceed the recession-era October 2008 figure (3.1%) and the October 2006 (2.5%) prerecession rate. This underlines that the nation's S&E population, although somewhat sheltered, is not immune from fluctuations in broader economic conditions.

In 2013, unemployment rates varied across occupational categories. Among those in S&E occupations, unemployment rates ranged from 2.8% (among engineers) to 4.5% (among physical scientists); among those in S&E-related and non-S&E occupations, the rate was 2.2% and 5.0%, respectively (Appendix Table 3-8). Additionally, advanced degree holders were generally less vulnerable to unemployment than those with only bachelor's degrees (Appendix Table 3-8).

The extent of unemployment also varies by career stages. S&E highest degree holders within 5 to 30 years after obtaining their highest degree were less likely to be unemployed than those at earlier points in their careers (Figure 3-15). As workers strengthen their skills by acquiring labor market experience and adding on-the-job knowledge to their formal training, their work situations become more secure. However, in the very late career stages (30 or more years after obtaining their highest degree), the unemployment rates turn higher than for those within 5 to 30 years after obtaining their highest degree. Growing selectivity about desirable work, skill obsolescence, and other factors may contribute to this phenomenon. The trends of lower unemployment during early-to-mid career stages compared with very early or very late stages hold across degree levels (Figure 3-15).

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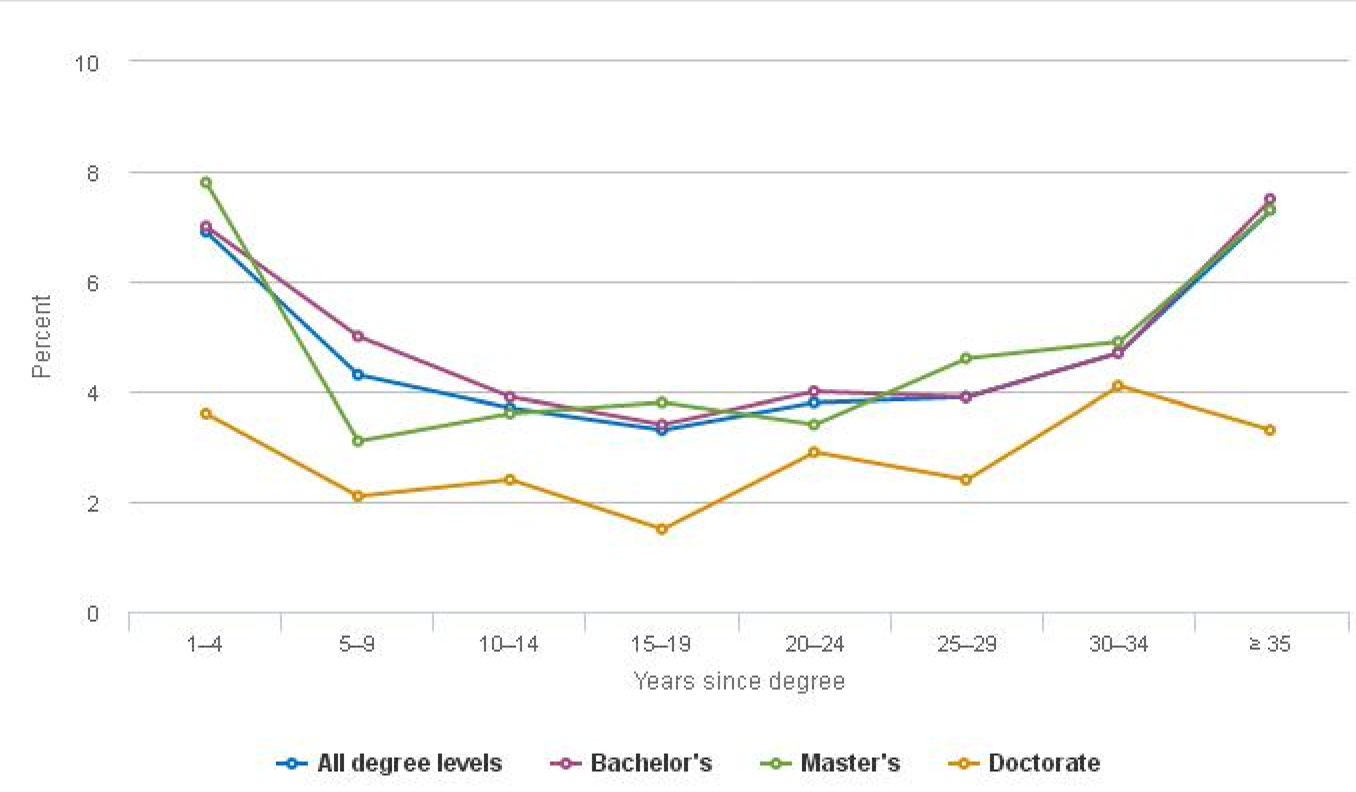
[i] The Bureau of Labor Statistics civilian unemployment rate for persons 16 years and over, not seasonally adjusted, is available at http://data.bls.gov/timeseries/LNU04000000. Accessed 21 November 2014.

Figure 3-15

Unemployment rates of S&E highest degree holders, by level of and years since highest degree: 2013



NOTE: All degree levels includes professional degrees not shown separately.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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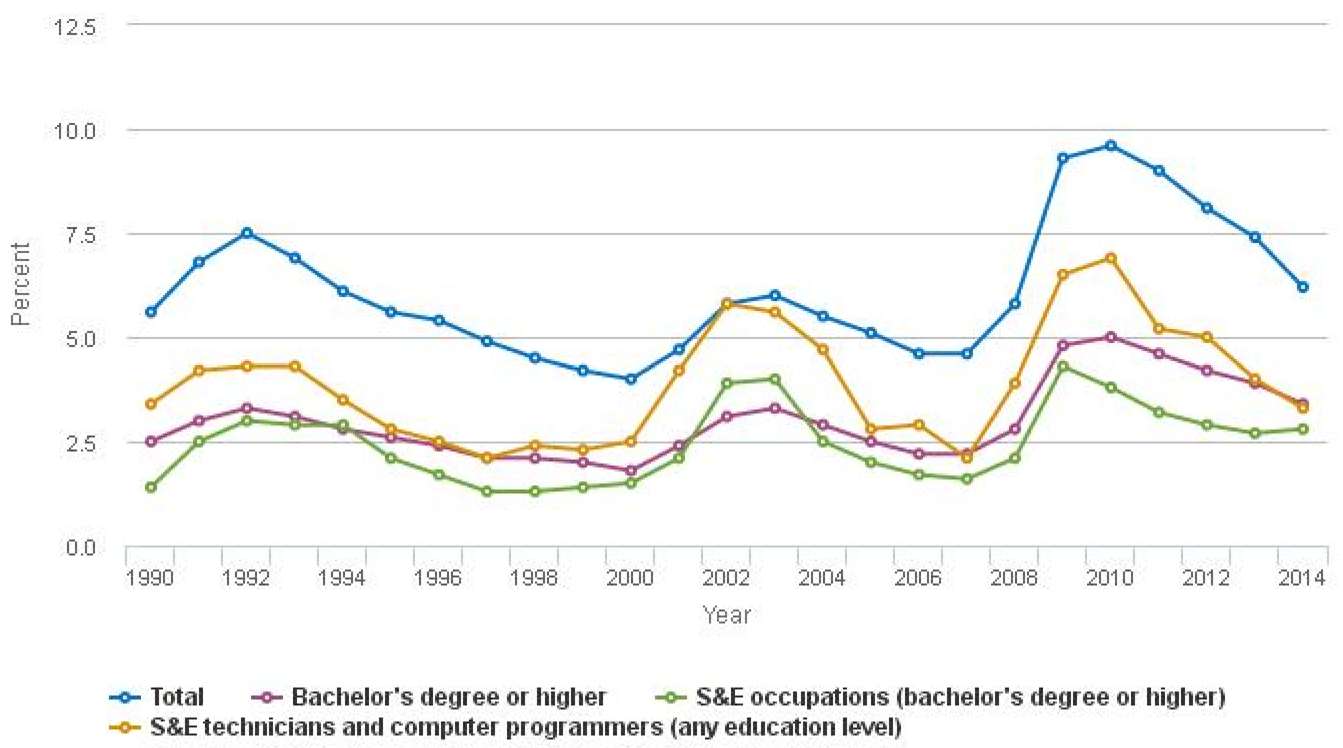
CPS unemployment rates over the past two decades[ii] indicate that workers in S&E occupations have historically experienced lower unemployment rates than the overall labor force (Figure 3-16). Additionally, during the economic downturn that began in late 2007, unemployment rates among S&E workers generally followed this historic pattern (Figure 3-17). Unemployment peaked at 5.7% in S&E jobs and 6.1% in the broader STEM occupations, which include computer programmers, S&E technicians, and S&E managers. In comparison, peak unemployment in all occupations was considerably higher (10.5%). In addition to lower rates, unemployment in S&E occupations began declining earlier than in all occupations.

[ii] The CPS is the source of the official unemployment rate.

Figure 3-16

Unemployment rate, by selected groups: 1990–2014



SOURCES: National Bureau of Economic Research, Merged Outgoing Rotation Group files (1990–2014), Bureau of Labor Statistics, Current Population Survey.

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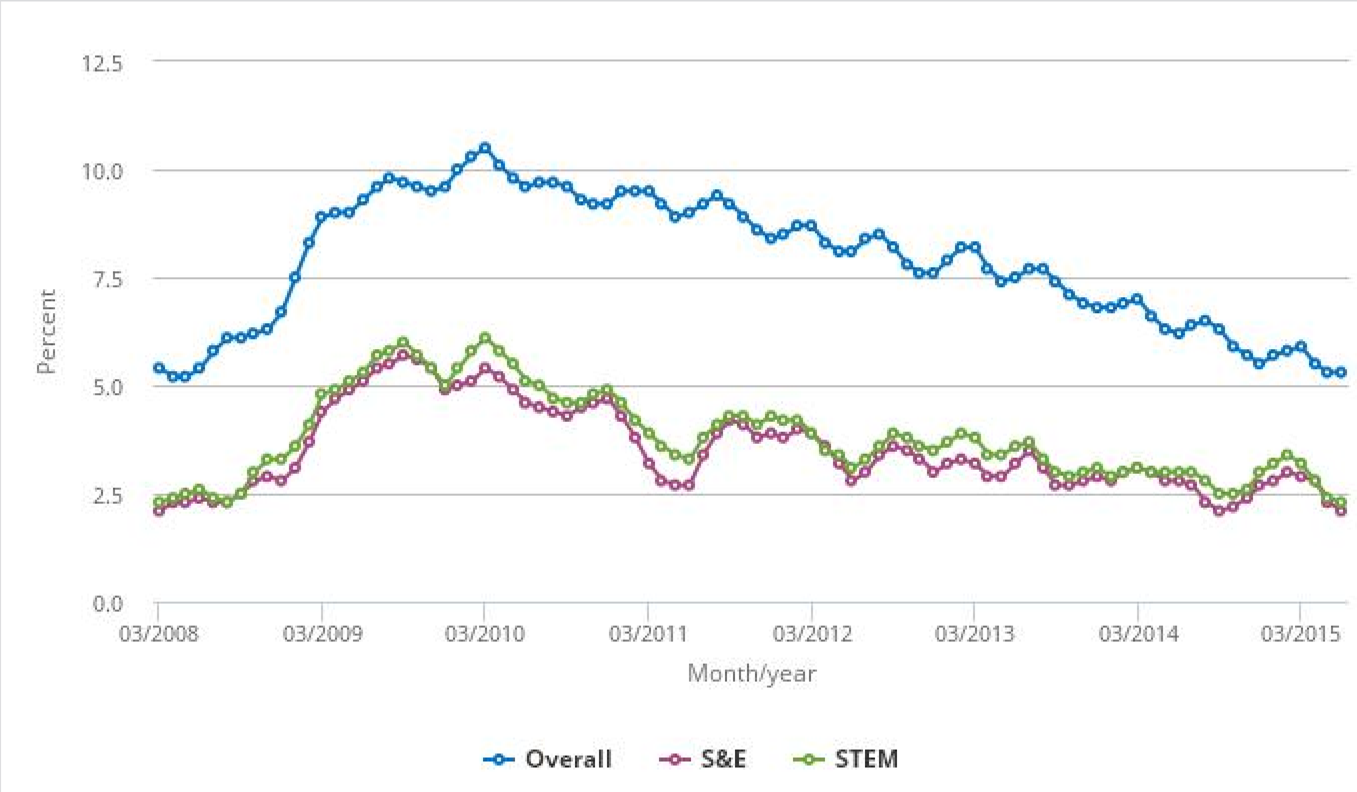
Figure 3-17

Unemployment rates for S&E, STEM, and the overall labor force: March 2008–June 2015



STEM = science, technology, engineering, and mathematics.

NOTES: Data for S&E, STEM, and the total labor force include people at all education levels. Estimates are not seasonally adjusted. Estimates are made by combining 3 months of microrecords of the Current Population Survey (CPS) in order to reduce the problem of small sample sizes and therefore will not match official CPS estimates based on a single month.

SOURCE: Bureau of Labor Statistics, CPS, Public Use Microdata Sample (PUMS), January 2008–June 2015.

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Working Involuntarily Out of One's Field of Highest Degree

Individuals invest time and financial resources in developing their knowledge and skills. Working outside of one's chosen field of education for involuntary reasons may create skills mismatches and economic inefficiencies that can be viewed as one indicator of labor market stress. Individuals work outside their highest degree field for a variety of reasons. Those reporting that they do so because suitable work was not available in their degree field are referred to here as involuntarily out of field (IOF) workers, and their number relative to all employed individuals is the IOF rate.

Of the nearly 24 million employed scientists and engineers in 2013, almost 1.6 million reported working out of their field of highest degree because of a lack of suitable jobs in their degree field, yielding an IOF rate of 6.7%. For the more than 12 million whose highest degree was in an S&E field, the IOF rate was 8.3% (Table 3-12). SESTAT respondents were allowed to provide more than one reason for working out of field. Other reasons cited by S&E degree holders included pay and promotion opportunities (reported by 1.7 million individuals), change in career or professional interests (1.2 million), working conditions (1.5 million), family-related reasons (776,000), job location

(1.4 million), and other reasons (263,000). This suggests that, in addition to lack of a suitable job, various job-related and personal attributes such as compensation, location, and professional interest may result in out-of-field employment.

Table 3-12 Scientists and engineers who are working involuntarily out of field, by S&E degree field: 2003–13

(Percent)

S&E degree field	2003	2006	2008	2010	2013
All scientists and engineers	5.9	6.2	5.3	6.4	6.7
Highest degree in S&E field	7.8	8.1	7.1	8.4	8.3
Biological, agricultural, and environmental life sciences	10.1	9.7	10.1	10.1	9.4
Computer and mathematical sciences	4.9	5.7	4.5	5.1	4.1
Physical sciences	8.8	8.6	7.1	8.2	8.3
Social sciences	10.1	10.6	9.2	11.3	11.8
Engineering	4.2	4.5	3.6	4.9	4.6

NOTES: Scientists and engineers include those with one or more S&E or S&E-related degrees at the bachelor's level or higher or those who have only a non-S&E degree at the bachelor's level or higher and are employed in an S&E or S&E-related occupation. The involuntarily out-of-field rate is the proportion of all employed individuals who report that their job is not related to their field of highest degree because a job in their highest degree field was not available.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2003–13), http://sestat.nsf.gov.

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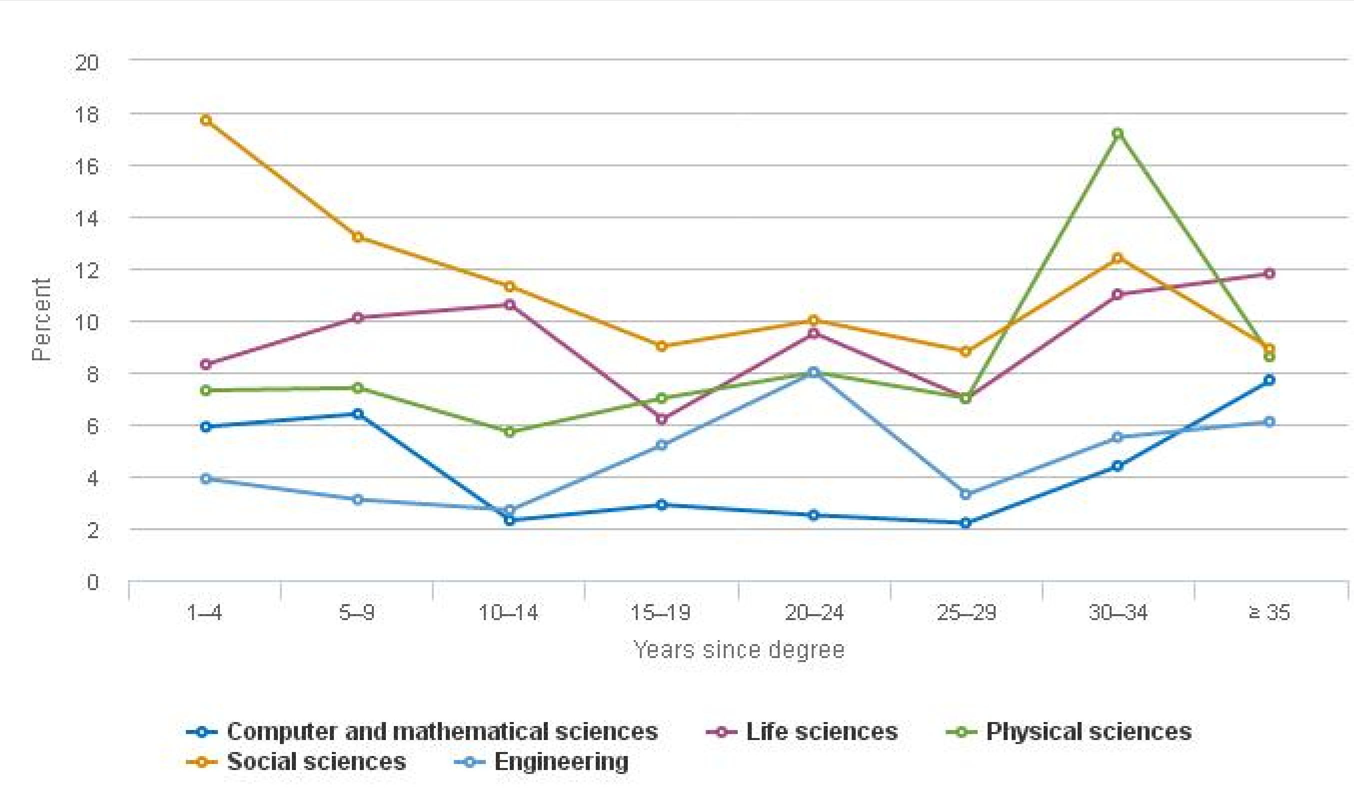
IOF rates vary by S&E degree fields and levels. Those with a highest degree in engineering or computer and mathematical sciences display lower IOF rates than those with a highest degree in physical, life, or social sciences (Table 3-12). The high IOF rates among social sciences degree holders, particularly in comparison with engineering and computer and mathematical sciences degree holders, are evident across most of the career cycle (Figure 3-18). Additionally, advanced degree holders are less likely to work involuntarily out of field than those with bachelor’s degrees only: in 2013, the IOF rate was 3.0% among S&E doctorate holders, 4.9% among those with S&E master’s degrees, and 9.8% among those with S&E bachelor’s degrees.

Figure 3-18

S&E highest degree holders who are working involuntarily out of field, by field of and years since highest degree: 2013



NOTE: Involuntarily out-of-field rate is the proportion of all employed individuals who reported working in a job not related to their field of highest degree because a job in that field was not available.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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Earnings

Based on the OES survey, individuals in S&E occupations earn considerably more than the overall workforce. Median annual salaries in 2014 in S&E occupations (regardless of education level or field) was $80,920, which is more than double the median for all U.S. workers ($35,540) (Table 3-13). This reflects a high level of formal education and technical skills associated with S&E occupations. Median S&E salaries in 2011–14 rose somewhat faster (1.7%) than for all U.S. workers (1.0%). In 2014, salaries for workers in S&E occupations ranged from $68,910 for social scientists to $89,090 for engineers. Salaries for workers in S&E-related occupations displayed similar patterns of higher earnings levels relative to the overall workforce. Health-related occupations, the largest segment of S&E-related occupations, cover a wide variety of workers ranging from physicians, surgeons, and practitioners to nurses, therapists, pharmacists, and health technicians; as a result, these occupations display a large variation in salary levels (Table 3-13).

Table 3-13 **Annual salaries in science, technology, and related occupations: May 2011–May 2014**

	Mean			Median		
Occupation	Annual salaries in 2011 ($)	Annual salaries in 2014 ($)	Average annual growth rate 2011–14 (%)	Annual salaries in 2011 ($)	Annual salaries in 2014 ($)	Average annual growth rate 2011–14 (%)
All U.S. employment	45,230	47,230	1.5	34,460	35,540	1.0
STEM occupations	80,360	85,530	2.1	74,450	78,730	1.9
S&E occupations	81,390	85,980	1.8	76,900	80,920	1.7
Computer and mathematical scientists	78,810	83,750	2.0	75,150	79,230	1.8
Life scientists	78,570	81,300	1.1	69,240	71,950	1.3
Physical scientists	81,890	85,140	1.3	73,820	76,390	1.1
Social scientists	72,400	75,320	1.3	66,370	68,910	1.3
Engineers	89,500	94,250	1.7	84,940	89,090	1.6
Technology occupations	76,600	82,300	2.4	63,760	67,650	2.0
S&E-related occupations (not listed above)	73,980	77,650	1.6	60,840	63,210	1.3
Health-related occupations	73,880	77,570	1.6	60,630	62,980	1.3
Registered nurses	69,110	69,790	0.3	65,950	66,640	0.3
Dentists, general	161,750	166,810	1.0	142,740	149,540	1.6
Family and general practitioners	177,330	186,320	1.7	167,000	180,180	2.6
Other S&E-related occupations	79,660	82,400	1.1	72,490	74,500	0.9
Non-STEM occupations	40,730	42,380	1.3	31,360	32,390	1.1
Chief executives	176,550	180,700	0.8	166,910	173,320	1.3
General and operations manager	114,490	117,200	0.8	95,150	97,270	0.7
Education administrators, postsecondary	97,170	101,910	1.6	84,280	88,390	1.6

	Mean			Median		
Occupation	Annual salaries in 2011 ($)	Annual salaries in 2014 ($)	Average annual growth rate 2011–14 (%)	Annual salaries in 2011 ($)	Annual salaries in 2014 ($)	Average annual growth rate 2011–14 (%)
Management analysts	87,980	90,860	1.1	78,490	80,880	1.0
Financial analysts	87,740	92,250	1.7	75,650	78,620	1.3
Lawyers	130,490	133,470	0.8	113,310	114,970	0.5
Technical writers	67,280	71,950	2.3	64,610	69,030	2.2

STEM = science, technology, engineering, and mathematics.

NOTES: See table 3-2 for definitions of S&E, S&E-related, and STEM occupations. Occupational Employment Statistics (OES) Survey employment data do not cover employment in some sectors of the agriculture, forestry, fishing, and hunting industry; in private households; or among self-employed individuals. As a result, the data do not represent total U.S. employment.

SOURCE: Bureau of Labor Statistics, OES Survey (May 2011, May 2014).

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The rest of this section presents earnings data for college-educated workers from NSF's NSCG and SESTAT. The NSCG, which covers the entire college-educated population of the United States (regardless of their S&E background), provides earnings data for individuals trained or employed in S&E fields and non-S&E fields. SESTAT, which covers the college-educated scientists and engineers population, is helpful for a deeper analysis of trends among various subgroups of individuals trained or employed in S&E.

Overall, college-educated individuals with an S&E or S&E-related degree enjoy an earnings premium compared to those with a non-S&E degree; for the most part, this earnings premium is present across career stages. Figure 3-19 presents data on median salaries for groups with S&E, S&E-related, or non-S&E highest degrees at comparable numbers of years since receiving their highest degrees. Although median salaries are similar in the beginning for S&E and non-S&E degree holders, both of which are lower than that for S&E-related degree holders, the rise in earnings associated with career progression is much steeper among individuals with S&E degrees. Among S&E highest degree holders, those with engineering or computer and mathematical sciences degrees earn more than degree holders in other broad S&E fields during early-to-mid career stages; engineering degree holders continue to enjoy an earnings premium through later career stages compared with their counterparts with degrees in most other broad S&E fields (Figure 3-20).

Figure 3-19

Median salaries for employed college-educated individuals, by broad field of highest degree and years since highest degree: 2013

NOTE: See table 3-2 for classification of S&E, S&E-related, and non-S&E degree fields.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, National Survey of College Graduates (2013).

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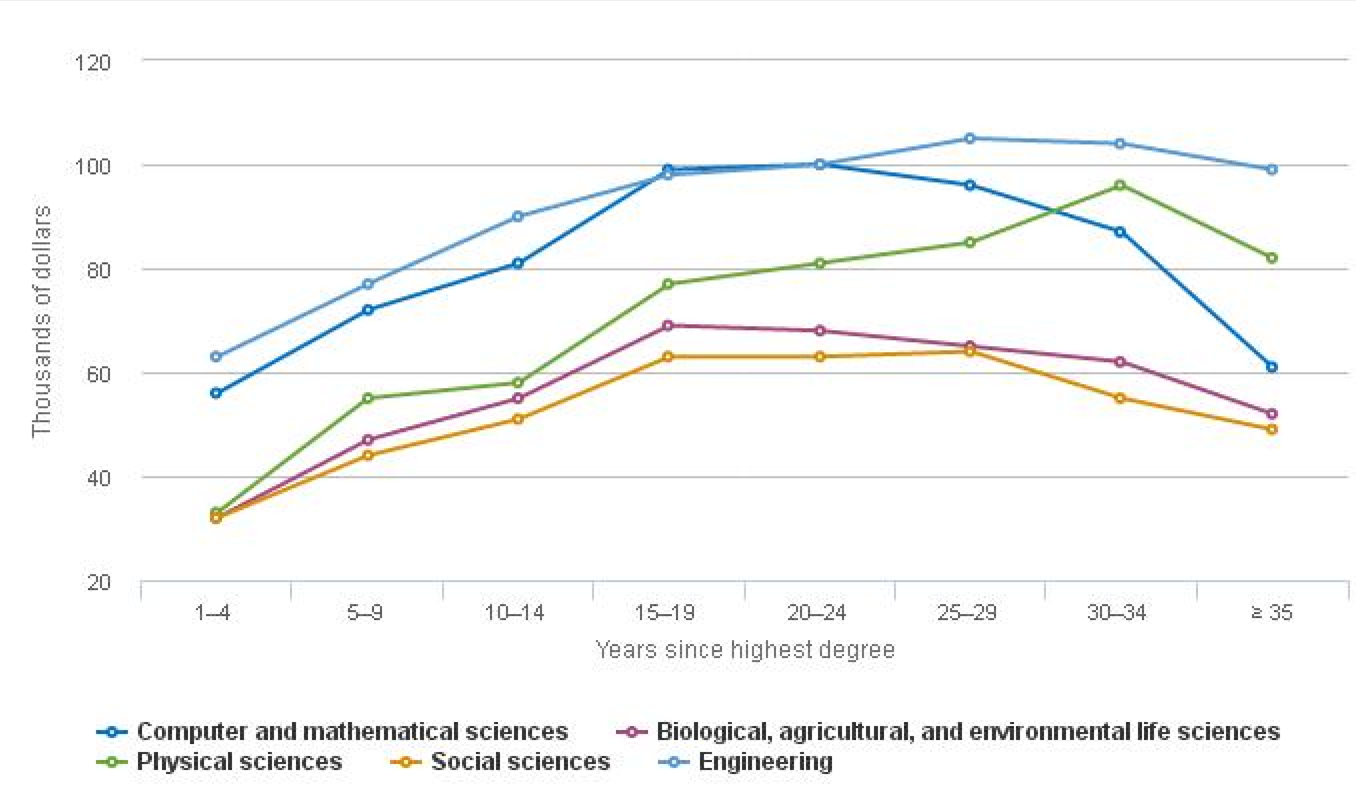
Figure 3-20

Median salaries for S&E highest degree holders, by broad field of and years since highest degree: 2013



SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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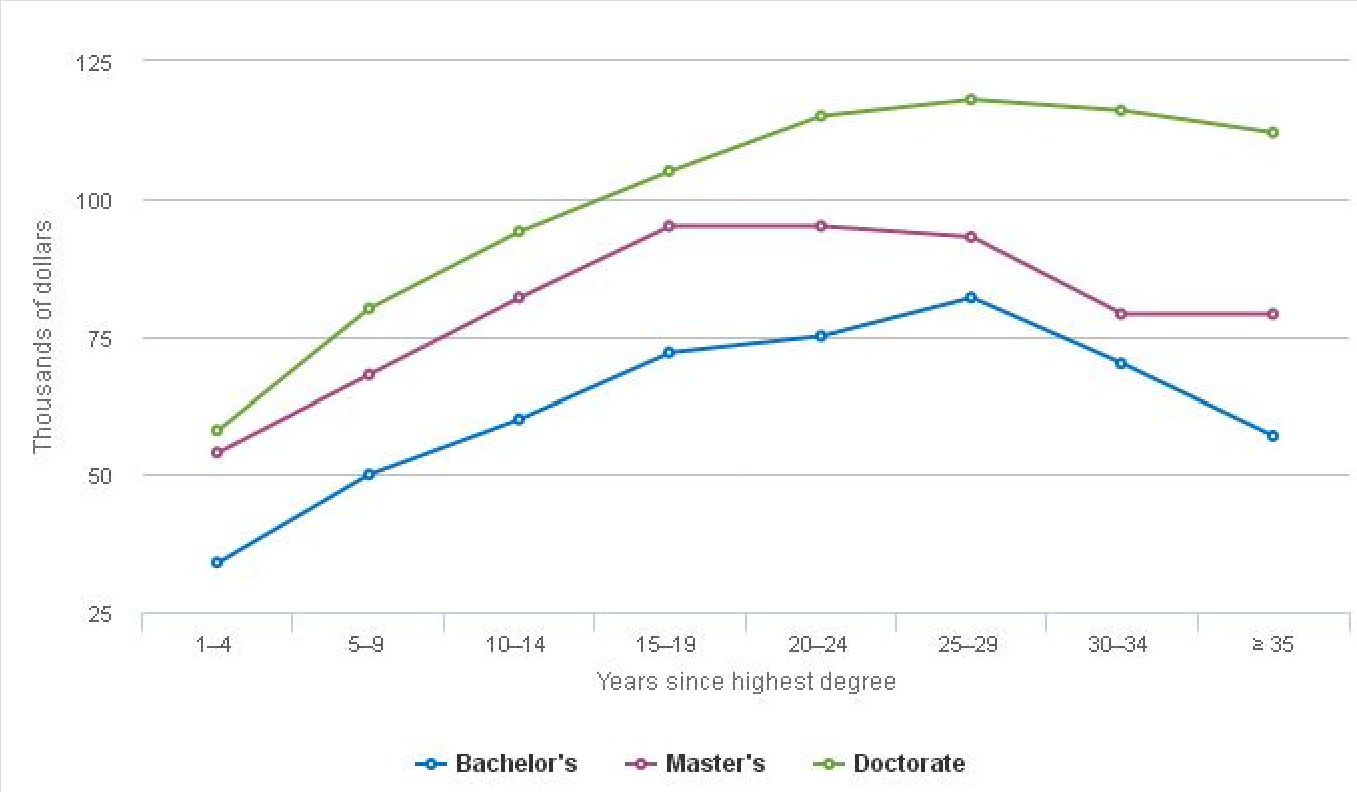
Earnings also vary by degree levels. For those with an S&E highest degree, annual median salaries rise with a master's or doctoral degree (Appendix Table 3-9), and this pattern holds across career stages (Figure 3-21). Among those with an S&E-related or non-S&E highest degree, professional degree holders earn the most (Appendix Table 3-9). The relatively high salaries among S&E-related or non-S&E professional degree holders are driven primarily by medical practitioners and lawyers, respectively. A majority of college graduate workers whose highest degree is a professional degree in an S&E-related field (70%) work as a diagnosing or treating practitioner (with a median salary of $140,000); a majority of those whose highest degree is a professional degree in a non-S&E field (76%) work as a lawyer or judge (with a median salary of $107,000).

Figure 3-21

Median salaries for S&E highest degree holders, by level of and years since highest degree: 2013



SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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Among employed individuals without a bachelor's degree, S&E occupations provide stable jobs with competitive salaries relative to those in non-S&E occupations. (See sidebar, S&E Workers Without a Bachelor's Degree.)

Recent S&E Graduates

In today's knowledge-based and globally integrated economy marked by rapid information flow and development of new knowledge, products, and processes, demand for certain skills and abilities may change fast. The employment outcomes of recent graduates are an important indicator of current changes in labor market conditions. Compared with experienced S&E workers, recent S&E graduates more often bring new ideas and newly acquired skills to the labor market. This section examines the employment outcomes of recent recipients of S&E bachelor's, master's, and doctoral degrees.

General Labor Market Indicators for Recent Graduates

Table 3-14 summarizes some basic labor market statistics in 2013 for recent recipients of S&E degrees; *recent* here is defined as between 1 and 5 years since receiving the highest degree. Among the nearly 24 million SESTAT respondents in February 2013, 2.1 million were *recent* S&E degree recipients. Overall, the unemployment rate among recent S&E graduates was 5.7%, compared with the 3.8% unemployment rate overall among the SESTAT population of scientists and engineers.

Table 3-14 Labor market indicators for recent S&E degree recipients up to 5 years after receiving degree, by level and field of highest degree: 2013

Indicator and highest degree level	All S&E fields	Biological, agricultural, and environmental life sciences	Computer and mathematical sciences	Physical sciences	Social sciences	Engineering
Unemployment rate (%)						
All degree levels	5.7	5.6	4.2	3.7	7.9	2.4
Bachelor's	6.5	6.4	3.3	4.7	9.0	3.1
Master's	4.2	3.8	6.7	S	5.1	0.8
Doctorate	2.3	2.6	S	5.0	3.1	S
Involuntarily out-of-field (IOF) rate (%)						
All degree levels	11.7	9.5	6.1	6.7	18.5	3.7
Bachelor's	14.4	10.8	8.2	9.8	22.2	3.9
Master's	6.0	8.0	S	S	9.1	4.8
Doctorate	1.6	2.7	S	5.3	3.2	S
Median annual salary ($)						
All degree levels	40,000	34,000	57,000	34,000	34,000	65,000
Bachelor's	35,000	30,000	52,000	30,000	31,000	60,000
Master's	57,000	43,000	77,000	33,000	45,000	75,000
Doctorate	62,000	49,000	76,000	60,000	60,000	88,000

S = suppressed for reasons of confidentiality and/or reliability.

NOTES: Median annual salaries are rounded to the nearest $1,000. All degree levels includes professional degrees not broken out separately. Data include degrees earned from February 2008 to February 2012. The IOF rate is the proportion of all employed individuals who report that their job is not related to their field of highest degree because a job in their highest degree field was not available.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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Among recent bachelor's degree holders, the unemployment rate averaged 6.5%, ranging from about 3% for those with engineering (3.1%) and computer and mathematical sciences (3.3%) degrees to 9.0% for those with social sciences degrees. Overall, unemployment was generally lower for those with recent doctorates than for those with recent bachelor's or master's level degrees. Early in their careers, as individuals gather labor market experience and on-the-job skills, they tend to have a higher incidence of job change and unemployment, which may partially explain some of the higher unemployment rates seen among those with a bachelor's degree as their highest degree.

A useful but more subjective indicator of labor market conditions for recent graduates is the proportion who report that their job is unrelated to their highest degree field because a job in their degree field was not available (i.e., the IOF rate). Of the nearly 2.1 million employed scientists and engineers who received their highest degree in an S&E field in the previous 5 years, an estimated 11.7% indicated working involuntarily out of field in 2013 (Table 3-14). As such, the IOF rate among recent S&E degree recipients in 2013 was higher than the IOF rate among the overall SESTAT population with an S&E highest degree (8.3%). SESTAT respondents were allowed to report more than one reason for working out of field as well as the most important reason for working out of field. When asked about the most important reason for working out of field, the reasons most frequently cited by recent S&E degree recipients were lack of a suitable job in their degree field (cited by 38% of those working out of field), followed by pay and promotion opportunities (20%) and change in career or professional interests (13%). The responses provided by all S&E highest degree holders working out of field (regardless of graduation year) were similar, but the factors were ranked differently: the most frequently cited reasons were pay and promotion opportunities (cited by 25% of all S&E highest degree holders working out of field), followed by change in career or professional interests (20%) and lack of a suitable job in their degree field (19%).

IOF rates vary across S&E degree levels and fields. Overall, IOF rates are lower among advanced degree holders compared with those with only bachelor's level degrees, but there exists significant variation across degree fields. Among recent bachelor's degree holders, the IOF rate ranged from 3.9% among recent engineering graduates to 22.2% among recent graduates in social sciences (Table 3-14). Among recent bachelor's degree holders in social sciences, IOF rates were high in all major fields, including economics, political sciences, psychology, and sociology and anthropology. However, within social sciences, recent master's degree and doctorate recipients experienced significantly lower IOF rates than recent bachelor's degree holders. On the contrary, among recent recipients of engineering degrees, IOF rates were similar across degree levels.

The median salary for recent S&E bachelor's degree recipients in 2013 was $35,000, ranging from $30,000 in life sciences and physical sciences to $60,000 in engineering (Table 3-14). Recent master's degree recipients had a median salary of $57,000, and recent doctorate recipients had a median salary of $62,000.

Recent Doctorate Recipients

The career rewards of highly skilled individuals in general, and doctorate holders in particular, often extend beyond salary and employment to the more personal rewards of doing the kind of work for which they have trained. No single standard measure satisfactorily reflects the state of the doctoral S&E labor market. This section discusses a range of relevant labor market indicators, including unemployment rates, IOF employment, employment in academia compared with other sectors, employment in postdoctoral positions, and salaries. Although a doctorate can expand career and salary opportunities, these opportunities may come at the price of many years of lost labor market earnings due to the number of years required to earn the degree.

Unemployment. In February 2013, the unemployment rate for science, engineering, and health (SEH) doctorate recipients up to 3 years after receiving their doctorates was 2.7% (Table 3-15), compared to an unemployment rate of 2.1% for all SEH doctorates. The unemployment rate for recent SEH doctorate recipients was also lower than the unemployment rate for the entire SESTAT population regardless of level or year of award of highest degree (3.8%).

Table 3-15 **Employment characteristics of recent SEH doctorate recipients up to 3 years after receiving doctorate, by field of degree: 2001–13**

	Recent doctorates (*n*)						Unemployment rate (%)						Involuntarily out-of-field rate (%)					
Field of doctorate	2001	2003	2006	2008	2010	2013	2001	2003	2006	2008	2010	2013	2001	2003	2006	2008	2010	2013
All recent SEH doctorates	48,700	43,700	49,500	52,600	52,700	45,500	1.3	2.5	1.2	1.5	2.3	2.7	2.8	2.1	1.4	1.3	1.8	2.3
Biological, agricultural, and environmental life sciences	12,300	11,200	12,600	13,400	14,100	12,200	1.4	2.4	0.9	1.7	1.5	3.4	2.6	1.0	0.3	1.0	1.5	2.6
Computer and information sciences	1,600	1,400	1,500	2,400	2,500	2,000	0.3	4.1	1.9	S	S	S	S	S	2.6	1.4	S	S
Mathematics and statistics	2,200	1,600	2,000	2,400	2,400	2,200	0.2	3.4	S	S	S	S	1.4	3.4	2.2	1.1	S	S
Physical sciences	7,700	6,500	7,400	7,500	7,700	6,400	1.5	1.3	1.1	3.0	2.6	4.8	5.4	4.2	2.6	2.3	1.4	1.7
Psychology	7,200	6,300	7,000	5,800	5,400	4,700	1.5	2.7	1.2	0.8	3.8	S	3.0	1.5	1.4	0.8	2.0	S
Social sciences	5,800	6,000	6,200	5,900	6,000	5,400	1.6	3.1	1.4	2.1	3.4	3.8	3.3	3.0	2.3	3.4	3.5	5.9
Engineering	9,400	8,000	9,500	12,000	11,300	9,600	1.5	3.0	1.8	1.2	2.7	2.1	2.0	3.0	1.6	0.7	1.9	2.2
Health	2,400	2,700	3,200	3,300	3,400	3,000	0.4	0.7	0.9	1.2	S	S	S	1.1	S	S	S	S

NOTES: S = suppressed for reasons of confidentiality and/or reliability.

SEH = science, engineering, and health.

Involuntarily out-of-field rate is the proportion of all employed individuals who report working in a job not related to their field of doctorate because a job in that field was not available. Data for 2001 and 2006 include graduates from 12 months to 36 months prior to the survey reference date; data for 2003, 2008, and 2010 include graduates from 15 months to 36 months prior to the survey reference date; data for 2013 include graduates from 19 months to 36 months prior to the survey reference date. Detail may not add to total because of rounding.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Doctorate Recipients (SDR) (2001–13), http://sestat.nsf.gov.

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Working involuntarily out of field. About 2.3% of employed recent SEH doctorate recipients reported that they took a job that was not related to the field of their doctorate because a suitable job in their field was not available (Table 3-15). This compared favorably with the IOF rate for the entire SESTAT population with an S&E highest degree (8.3%).

Tenure-track positions. Although many science doctorate recipients aspire to tenure-track academic appointments (Sauermann and Roach 2012), most end up working in other types of positions and sectors. In 2013, about 12% of those who earned their SEH doctorate within the previous 3 years had a tenure or tenure-track faculty appointment (Table 3-16).[i] Across the broad SEH fields, this proportion varied significantly, from less than 10% among recent doctorates in life sciences, physical sciences, and engineering to 38% among those in social sciences.

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[i] In this chapter, someone who is on tenure track but not yet tenured is referred to as "tenure-track" faculty.

Table 3-16 **Employed SEH doctorate recipients holding tenure and tenure-track appointments at academic institutions, by field of and years since degree: 1993–2013**

(Percent)

Years since doctorate and field	1993	1995	1997	1999	2001	2003	2006	2008	2010	2013
< 3 years										
All SEH fields	18.1	16.3	15.8	13.5	16.5	18.6	17.7	16.2	14.7	12.4
Biological, agricultural, and environmental life sciences	9.0	8.5	9.3	7.7	8.6	7.8	7.2	6.5	7.6	5.3
Computer and information sciences	31.5	36.5	23.4	18.2	20.7	32.5	31.2	22.0	20.8	21.1
Mathematics and statistics	40.9	39.8	26.9	18.9	25.2	38.4	31.6	31.3	26.1	25.0
Physical sciences	8.8	6.9	8.5	7.8	10.0	13.3	9.8	8.8	6.8	6.9
Psychology	12.8	13.6	14.7	16.0	15.6	14.6	17.0	18.1	16.0	11.1
Social sciences	43.5	35.9	37.4	35.4	38.5	44.8	39.3	45.4	41.1	38.0
Engineering	15.0	11.5	9.4	6.4	11.3	10.8	12.4	9.3	7.5	6.6
Health	33.9	34.2	30.1	28.1	32.1	30.3	36.2	27.7	24.2	20.7
3–5 years										
All SEH fields	27.0	24.6	24.2	21.0	18.5	23.8	25.9	22.9	19.7	19.4
Biological, agricultural, and environmental life sciences	17.3	17.0	18.1	16.4	14.3	15.5	13.7	14.3	10.6	10.6
Computer and information sciences	55.7	37.4	40.7	25.9	17.3	32.2	45.7	37.8	22.2	13.8
Mathematics and statistics	54.9	45.5	48.1	41.0	28.9	45.5	50.6	40.7	41.7	29.6

Years since doctorate and field	1993	1995	1997	1999	2001	2003	2006	2008	2010	2013
Physical sciences	18.8	15.5	14.5	11.9	15.8	18.3	19.7	16.5	14.7	14.3
Psychology	17.0	20.7	16.8	17.6	17.5	19.9	23.8	18.3	19.1	17.6
Social sciences	54.3	52.4	50.4	46.5	38.8	46.0	50.4	48.9	46.7	48.5
Engineering	22.7	19.3	19.4	12.6	10.8	15.9	16.3	15.5	13.0	14.6
Health	47.4	40.2	41.1	39.5	25.1	40.8	43.1	34.4	33.3	32.4

SEH = science, engineering, and health.

NOTES: Proportions are calculated on the basis of all doctorates working in all sectors of the economy. Data for 1993–99, 2001, and 2006 include graduates from 12 months to 60 months prior to the survey reference date; data for 2003, 2008, and 2010 include graduates from 15 months to 60 months prior to the survey reference date; data for 2013 include graduates from 19 months to 60 months prior to the survey reference date.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Doctorate Recipients (1993–2013), http://sestat.nsf.gov.

Science and Engineering Indicators 2016

The proportion of SEH doctorates who hold a tenure or tenure-track faculty appointment increases with years of experience. In 2013, 19% of SEH doctorates in the labor market for 3 to 5 years had tenure or a tenure-track appointment, compared with 12% of their colleagues who were within 3 years of doctorate receipt (Table 3-16). The extent of the increase varies across the broad areas of training. In social sciences, for example, a relatively large percentage of individuals obtain a tenure or tenure-track position within 3 years of earning their doctorate, and the increase associated with 3 to 5 years of labor market exposure is more modest than in some other fields, such as physical sciences or engineering. (See chapter 5 for an in-depth discussion of various types of academic positions held by S&E doctorate holders.)

The availability of tenure-track positions may be counterbalanced by the availability of desirable nonacademic employment opportunities. Among recent doctorates in most S&E fields, median salaries are significantly higher in the business sector than in tenured or tenure-track academic positions (Table 3-17). The proportion of recent graduates who obtain tenure or tenure-track employment has declined since 1993 in a number of broad areas of SEH training (Table 3-16). One of the steepest declines occurred in computer sciences, particularly among individuals within 3 to 5 years of receiving their doctorates, despite the high demand for computer sciences faculty.

Table 3-17 **Median salaries for recent SEH doctorate recipients up to 5 years after receiving degree, by field of degree and employment sector: 2013**

(Dollars)

		Education					
		4-year institutions					
Field of doctorate	All sectors	All positions	Tenured or tenure-track position	Postdoc	2-year or precollege institutions	Government	Business/ industry
All SEH fields	70,000	54,000	71,000	44,000	53,000	79,000	91,000

		Education					
		4-year institutions					
Field of doctorate	All sectors	All positions	Tenured or tenure-track position	Postdoc	2-year or precollege institutions	Government	Business/ industry
Biological, agricultural, and environmental life sciences	51,000	46,000	68,000	43,000	46,000	68,000	71,000
Computer and information sciences	105,000	78,000	88,000	S	S	101,000	120,000
Mathematics and statistics	72,000	60,000	62,000	63,000	S	89,000	96,000
Physical sciences	63,000	50,000	60,000	46,000	51,000	73,000	90,000
Psychology	62,000	54,000	60,000	42,000	53,000	83,000	66,000
Social sciences	66,000	62,000	68,000	48,000	58,000	89,000	86,000
Engineering	90,000	70,000	82,000	45,000	S	88,000	99,000
Health	78,000	70,000	71,000	42,000	S	79,000	99,000

NOTES: S = suppressed for reasons of confidentiality and/or reliability.

SEH = science, engineering, and health.

Salaries are rounded to the nearest $1,000. Data include graduates from 19 months to 60 months prior to the survey reference date. The 2-year or precollege institutions include 2-year colleges and community colleges or technical institutes and also preschool, elementary, middle, or secondary schools. The 4-year institutions include 4-year colleges or universities, medical schools, and university-affiliated research institutes.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Doctorate Recipients (2013), http://sestat.nsf.gov.

Science and Engineering Indicators 2016

Salaries for recent SEH doctorate recipients. For all SEH degree fields in 2013, the median annual salary for recent doctorate recipients within 5 years after receiving their degrees was $70,000 (Table 3-17). Across various SEH degree fields, median annual salaries ranged from a low of $51,000 in biological sciences to a high of $105,000 in computer and information sciences. Between 2010 and 2013, median salaries increased overall among recent recipients of SEH doctoral degrees (the median salary for recent SEH doctorate recipients in 2010 was $66,000).

By type of employment, salaries for recent doctorate recipients ranged from $44,000 for postdoctoral positions in 4-year institutions to $91,000 for those employed in the business sector (Table 3-17). Each sector, however, exhibited substantial internal variation by SEH fields of training.

Postdoctoral Positions

A significant number of new S&E doctorate recipients take a postdoctoral appointment (generally known as a postdoc) as their first position after receiving their doctorate. Postdoc positions are defined as temporary, short-term positions, primarily for acquiring additional training in an academic, government, industry, or nonprofit setting.[ii] In many S&E disciplines, a postdoc position is necessary to be competitive for obtaining a faculty position.

Individuals in postdoc positions often perform cutting-edge research and receive valuable training. These positions, however, generally offer lower salaries than permanent positions. A factor that has received much attention in science policy is the growth seen over the last three decades in the number of postdocs in both traditional (e.g., life sciences and physical sciences) and nontraditional (e.g., social sciences and engineering) academic disciplines and in an environment where the availability of research-intensive academic positions—the type of jobs for which postdocs are typically trained—have not risen at a similar pace (e.g., American Chemical Society 2013; National Academy of Sciences, National Academy of Engineering, and Institute of Medicine 2000 and 2014; National Institutes of Health 2012;). Neither the reasons for this growth nor its effects on the state of scientific research are well understood. However, possible contributing factors include increases in competition for tenure-track academic research jobs, the need for collaborative research in large teams, the influx of graduate students in SEH areas with strong postdoc traditions, and the need for additional specialized training. (See sidebar, Employment Patterns among Biomedical Sciences Doctorates.)

[ii] Although the formal job title is often *postdoc fellowship* or *research associate*, titles vary among organizations. This chapter generally uses the shorter, more commonly used, and best understood name, *postdoc*. A postdoc is generally considered a temporary position that individuals take primarily for additional training—a period of advanced professional apprenticeship—after completion of a doctorate.

Employment Patterns among Biomedical Sciences Doctorates

Employment patterns in the areas of biomedical sciences have changed in the past two decades. The growth in the number of doctorates trained in the field has far surpassed the growth in tenure-track academic positions, intensifying the competition for academic jobs (NIH 2012). This sidebar uses data from NSF's Survey of Doctorate Recipients (SDR) to examine the changes over time in employment patterns among U.S.-trained biomedical sciences doctorates. Foreign-trained doctorates are not covered by the SDR and are therefore not included in the analysis presented in this sidebar.

Between 1993 and 2013, the number of biomedical sciences doctorate holders rose substantially, about 83%, from about 105,000 to nearly 192,000.* Over this same time, the proportion employed in 4-year academic institutions declined (from 55% to 49%) as did the proportion employed in tenure or tenure-track positions (from 35% to 25%) despite the fact that both increased in absolute number. In contrast, the proportion of biomedical sciences doctorates employed in the business sector rose (from 31% to 38%). The comparable changes among doctorate holders in other SEH areas of training were smaller: between 1993 and 2013, the total size of this population rose 58%, the proportion employed in the 4-year academic institutions declined (from 43% to 40%), and the proportion employed in the business sector rose (from 45% to 47%).

Between 1993 and 2013, the proportion of biomedical sciences doctorates reporting research (basic or applied) as their primary or secondary work activity declined in both 4-year academic institutions (from 78% to 70%) and businesses (from 55% to 47%). The majority of the increase in the number of biomedical sciences doctorates employed in the business sector was driven by those whose jobs did not involve research as their primary or secondary work activity. For-profit businesses accounted for two-thirds of the increase in the overall business sector biomedical workforce, with nonprofit organizations and unincorporated businesses accounting for the remainder of the increase. The for-profit business sector also has a smaller share of its biomedical doctorates performing research as a primary or secondary work activity compared to nonprofit organizations.

The field of biomedical sciences has a strong tradition of postdoctoral training. In 2013, among those who received their doctorates within the past 10 years of being surveyed, 26% of biomedical sciences doctorates reported being in a postdoctoral position, compared to only 7% of those with a doctorate in another SEH field. When asked about the primary reason for accepting these positions, "postdoc generally expected in field" was reported by 43% of postdocs with a biomedical sciences doctorate, compared to about 31% of postdocs with a doctorate in another SEH field. However, between 1993 and 2013, the proportion of doctorates employed in postdoc appointments declined both among biomedical sciences doctorates (from 30% to 26%) and among doctorates in other SEH fields (from 9% to 7%).

Despite the changes in employment patterns, overall employment indicators for biomedical sciences doctorates are generally favorable. In 2013, the unemployment rate for this group was 2.3%, and the rate of working involuntarily out of field (IOF) was 2.9%. These rates are both similar to those for doctorates in other SEH areas of training: an unemployment rate of 2.0% and an IOF rate of 3.0%. The median salary for biomedical sciences doctorates was $91,000 (compared to $99,000 for doctorates in other SEH areas of training). Median salaries in 4-year academic institutions and for-profit businesses, the two sectors that together employed three-fourths of biomedical sciences doctorates, were $78,000 and $120,000, respectively.

Foreign-trained doctorates in the field have grown significantly over time (NIH 2012), but the data on this segment of the workforce are limited. The SDR data, which cover U.S.-trained doctorate holders, show that the number of foreign-born individuals in the field has increased rapidly over the past two decades: between 1993 and 2013, the number of non-U.S. citizens with U.S. biomedical sciences doctorates rose by 260%; the comparable increase among other SEH doctorates as a whole, although substantial, was smaller (143%).

* See NIH (2012) for a discussion on the fields of science considered to be biomedical sciences. Based on the report, the following degree categories from the SDR are included in the data presented in this sidebar: biochemistry and biophysics, bioengineering and biomedical engineering, cell and molecular biology, microbiological sciences and immunology, zoology, biology (general), botany, ecology, genetics (animal and plant), nutritional science, pharmacology (human and animal), physiology and pathology (human and animal), and other biological sciences. Agricultural and food sciences, and environmental life sciences are not included in the analysis.

Number of postdocs. The estimated number of postdocs varies depending on the data source used. No single data source measures the entire population of postdocs. Two NSF surveys, the Survey of Doctorate Recipients (SDR) and the Survey of Graduate Students and Postdoctorates in Science and Engineering, include data related to the number of postdocs in the United States. The SDR estimated that 27,100 U.S. SEH doctorate recipients in 2013 were employed in postdoc positions, compared with 30,800 in 2010 and 19,800 a decade earlier in 2003. The vast majority of these postdoc positions were in 4-year academic institutions (75% in 2013), with the remainder in the business sector (14% in 2013) and government sector (11% in 2013). Within the business sector, nonprofit organizations accounted for the vast majority of postdoc positions.

The estimated totals from NSF's Survey of Graduate Students and Postdoctorates in Science and Engineering, which cover academic postdocs, are significantly higher: 61,900 in 2013, compared with 63,400 in 2010 and 46,700 in 2003 (NSF/NCSES, 2015a and 2015b). The two surveys cover different segments of the postdoc population. The Survey of Graduate Students and Postdoctorates in Science and Engineering gathers information on postdocs employed in U.S. academic graduate departments, regardless of where these individuals earned their doctorates. It does not cover individuals in nonacademic employment, at non-degree-granting graduate departments, or at some university research centers. In contrast, the SDR covers U.S. residents who earned research doctorates in SEH fields from U.S. universities, but not those with doctorates from non-U.S. universities. Additionally, the SDR does not cover some recent doctorates.[iii] As a result, the SDR omits a large number of postdocs who are foreign trained or who had completed a 1-year postdoc immediately after graduation from a U.S. institution. The two survey estimates overlap in some populations (U.S.-trained doctorates and those working in academia), but differ in others (the Survey of Graduate Students and Postdoctorates in Science and Engineering covers foreign-trained doctorates but not those in the industry or government sectors). In addition, the titles of postdoc researchers vary across organizations and often change as individuals advance through their postdoc appointments; both of these factors further complicate the data collection process (NIH 2012).[iv]

Postdocs by academic discipline. Although postdocs are increasingly common in SEH fields, the extent to which a postdoc appointment is part of an individual's career path varies greatly across SEH fields. Postdocs have historically been more common in life sciences and physical sciences than in other fields such as social sciences and engineering. Among new doctorate recipients in 2013, nearly 64% in life sciences (including agricultural sciences /natural resources, biological/biomedical sciences, and health sciences) and 54% in physical sciences indicated they would take a postdoc appointment, compared to 36% in social sciences and 35% in engineering (Appendix Table 3-10).[v] However, in life sciences and physical sciences, the proportion of new doctorate recipients indicating that they would take a postdoc position rose significantly between the early 1970s and the early 1990s and has fluctuated within a relatively narrow range since then. In social sciences, the comparable proportion has continued to rise gradually since the early 1970s. In engineering, the comparable proportion has risen overall between 1973 and 2013 despite periodic fluctuations within this 40-year period.

Another indicator of the variation in the postdoc tradition across S&E disciplines is the proportion of recent graduates who are employed as a postdoc (as opposed to those who plan to take a postdoc position after graduation). In 2013, about half of those who received their doctorates in the previous 3 years in biological, agricultural, and environmental life sciences (54%) or physical sciences (45%) were employed in postdoc positions, compared to only 6% of those who received doctorates in social sciences (Figure 3-22).

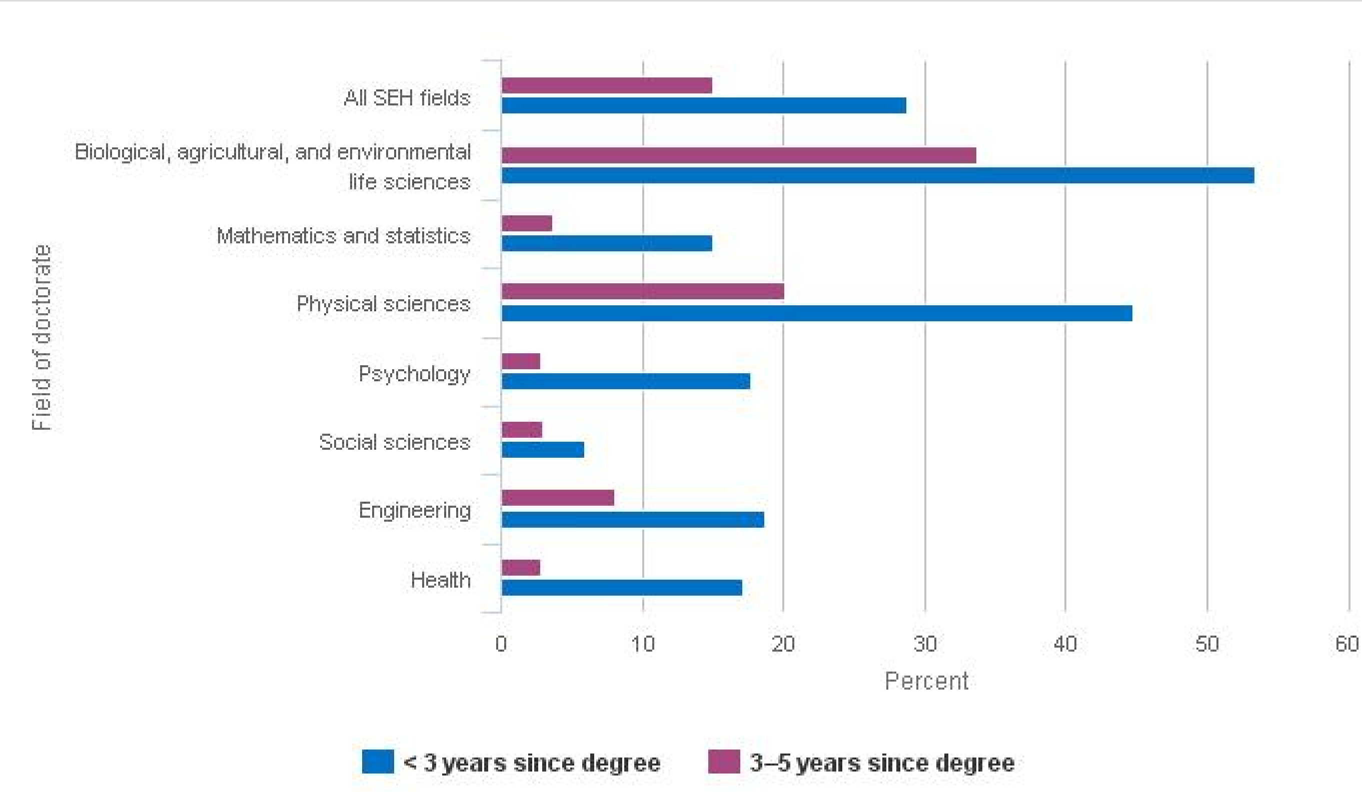
[iii] Data from the 2013 SDR were collected from doctoral graduates who received SEH research degrees from a U.S. academic institution before 1 July 2011 and as such underestimate the number of 1-year postdoctoral appointments completed prior to the reference date of February 2013.

[iv] NSF is currently developing a data collection strategy as part of its Early Career Doctorates Project (ECDP) to gather in-depth information about postdoc researchers and other early career doctorates. The ECDP will collect information related to educational achievement, professional activities, employer demographics, professional and personal life balance, mentoring, training and research opportunities, and career paths and plans for individuals who earned their doctorate in the past 10 years and are employed in an academic institution or a research facility.

[v] These data are from the Survey of Earned Doctorates (SED), which is administered to individuals receiving research doctoral degrees from all accredited U.S. institutions.

Figure 3-22

Recent U.S. SEH doctorate recipients in postdoc positions, by field of and years since doctorate: 2013



SEH = science, engineering, and health.

NOTES: Proportions are calculated on the basis of all doctorates working in all sectors of the economy. Data include graduates from 19 months to 60 months prior to the survey reference date (February 2013). Data for computer and information sciences doctorates are suppressed for reasons of confidentiality and/or reliability.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Doctorate Recipients (2013), http://sestat.nsf.gov.

Science and Engineering Indicators 2016

Postdoc compensation. Low compensation for postdocs is frequently raised as a concern by those who are worried about the effect of the increasing number of postdoc positions on the attractiveness of science careers. In 2013, among individuals who had received their doctorate within the past 5 years, the median salary for postdocs ($46,000) was just over half the median salary for individuals who were in other employment (e.g., non-postdoc positions) ($80,000) (Table 3-18). The postdoc salary differential ranged from about half among individuals with doctorates in engineering (52%) and health (55%) to three-quarters or more among those with doctorates in social sciences (75%) and mathematics and statistics (85%).

Table 3-18	Median salaries for recent U.S. SEH doctorate recipients in postdoc and non-postdoc positions up to 5 years after receiving degree: 2013

(Dollars)

Field of doctorate	All positions	Postdocs	Non-postdocs
All SEH	70,000	46,000	80,000
Biological, agricultural, and environmental life sciences	51,000	44,000	66,000
Computer and information sciences	105,000	S	106,000
Mathematics and statistics	72,000	64,000	75,000
Physical sciences	63,000	48,000	77,000
Psychology	62,000	42,000	65,000
Social sciences	66,000	50,000	67,000
Engineering	90,000	47,000	91,000
Health	78,000	45,000	82,000

NOTES: S = suppressed for reasons of confidentiality and/or reliability.
SEH = science, engineering, and health.
Salaries are rounded to the nearest $1,000. Data include graduates from 19 months to 60 months prior to the survey reference date.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Doctorate Recipients (2013), http://sestat.nsf.gov.

Science and Engineering Indicators 2016

Among recent graduates, somewhat larger proportions of postdocs than non-postdocs have access to certain employer-provided benefits, such as health insurance (96% of postdocs and 91% of non-postdocs) and paid vacation, sick, or personal days (90% of postdocs and 84% of non-postdocs). However, a much smaller proportion of recent graduates in postdoc positions have access to employer-provided pensions or retirement plans (54% of postdocs and 82% of non-postdocs) or profit-sharing plans (6% of postdocs and 23% of non-postdocs). Information on the quality of these benefits—for example, the coverage and premium of health insurance plans, number of personal days offered by employers, and type of retirement benefits and profit sharing plans—is not available.

Reasons for taking postdoc positions. The 2013 SDR asked individuals in postdoc positions to report their primary reason for accepting these appointments. Most responses were consistent with the traditional objective of a postdoc position as a type of advanced apprenticeship for career progression, such as “postdoc generally expected in field” (37%), “additional training in PhD field” (18%), “training in an area outside of PhD field” (15%), or “work with a specific person or place” (14%). A smaller proportion (12%) of those in postdoc appointments reported lack of other suitable employment as the primary reason for accepting these positions. However, in life sciences and physical sciences, the two broad fields with relatively high levels of postdoc appointments, the proportions of those reporting lack of other employment as the primary reason for accepting a postdoc position were low (11% and 15%, respectively) compared with the proportion of those in social sciences (40%), an area where postdocs are typically not as common.

Characteristics of postdocs. According to the Survey of Graduate Students and Postdoctorates in Science and Engineering, women held 39% of the nearly 62,000 academic postdoc positions in 2013 in SEH fields.[vi] Temporary visa holders accounted for 52% of the academic postdocs, and U.S. citizens and permanent residents accounted for the remaining 48%. Among postdocs in engineering, however, the proportion of women was lower (22%) and the proportion of temporary visa holders was higher (62%) compared to the overall SEH shares. Between 1979 and

2013, the number of academic postdocs increased threefold, driven primarily by temporary visa holders who accounted for nearly two-thirds (60%) of the total increase. The majority of academic postdocs (64%) in 2013 were supported by research grants; the rest were supported by fellowships, traineeships, or other mechanisms.

[vi] The data tables for the 2013 Survey of Graduate Students and Postdoctorates in Science and Engineering are available at http://ncsesdata.nsf.gov/gradpostdoc/2013/ (accessed on 19 August 2015).

Age and Retirement of the S&E Workforce

The U.S. S&E workforce, reflecting overall population trends, is aging. This section focuses on indicators of the aging of the S&E workforce, including retirement patterns of S&E workers and workforce participation levels among older individuals. The age distribution and retirement patterns of S&E workers have important implications for the supply of S&E expertise in the economy, but the overall effect is uncertain. Over time, members of the S&E labor force may gain skills, experience, and judgment that translate into rising output and productivity. Consequently, the retirement of large numbers of experienced workers could mean the loss of valuable S&E expertise and knowledge. However, the retirement of older workers also makes room for newly trained S&E workers who may bring updated skills and new approaches to solving problems.[i]

The aging of the S&E labor force is reflected in the median age, which has risen from 41 years in 1993 to 43 years in 2013. For proper context, the median age nationally for the U.S. population was 34 years in 1993 and 38 years in 2013.[ii] Another indicator, the percentage of individuals in the S&E labor force between 51 and 75 years of age, has risen from about 20% in 1993 to 34% in 2013 (Figure 3-23). Over that period, this proportion rose for both men and women, but the women in the labor force continue to be younger relative to their male counterparts (Figure 3-23). In 1993, the median ages were 38 years for women and 42 years for men, whereas in 2013 the median ages were 42 years for women and 45 years for men.

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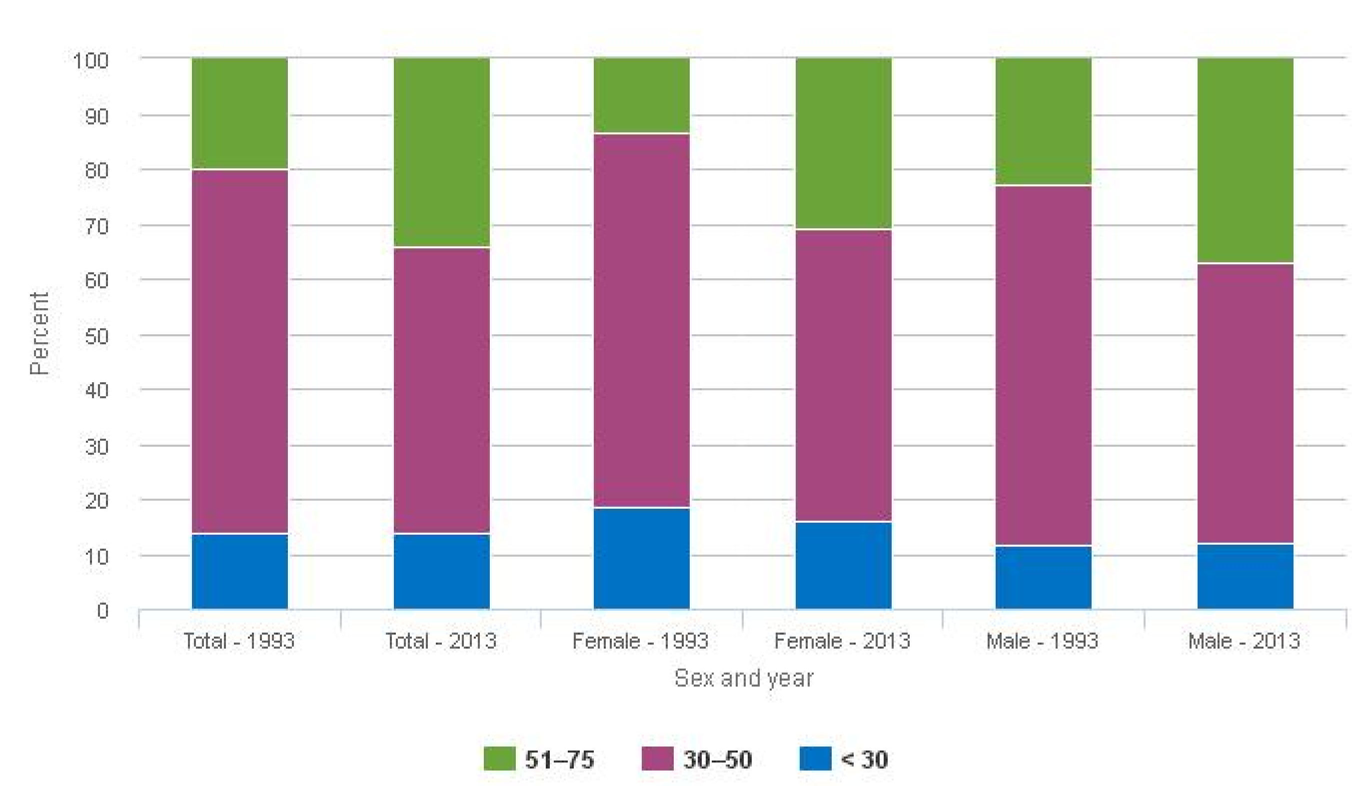
[i] See Stephan and Levin (1992) and Jones, Reedy, and Weinberg (2014) for in-depth discussions on age and scientific productivity.

[ii] The 1993 and 2013 data on median age for the U.S. population are from the U.S. Census Bureau's Population Estimates Program, available at http://www.census.gov/popest/data/historical/index.html. The 2013 data are available at http://www.census.gov/popest/data/national/asrh/2013/index.html and the 1993 data are available at http://www.census.gov/popest/data/national/totals/1990s/tables/nat-agesex.txt (accessed on 2 February 2015).

Figure 3-23

Age distribution of scientists and engineers in the labor force, by sex: 1993 and 2013



NOTES: For 1993 data, scientists and engineers include those with one or more S&E degrees at the bachelor's level or higher or those who have only a non-S&E degree at the bachelor's level or higher and are employed in an S&E occupation. For 2013 data, scientists and engineers include those with one or more S&E or S&E-related degrees at the bachelor's level or higher or those who have only a non-S&E degree at the bachelor's level or higher and are employed in an S&E or S&E-related occupation. The Scientists and Engineers Statistical Data System (SESTAT) does not cover scientists and engineers over age 75.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, SESTAT (1993, 2013), http://sestat.nsf.gov.

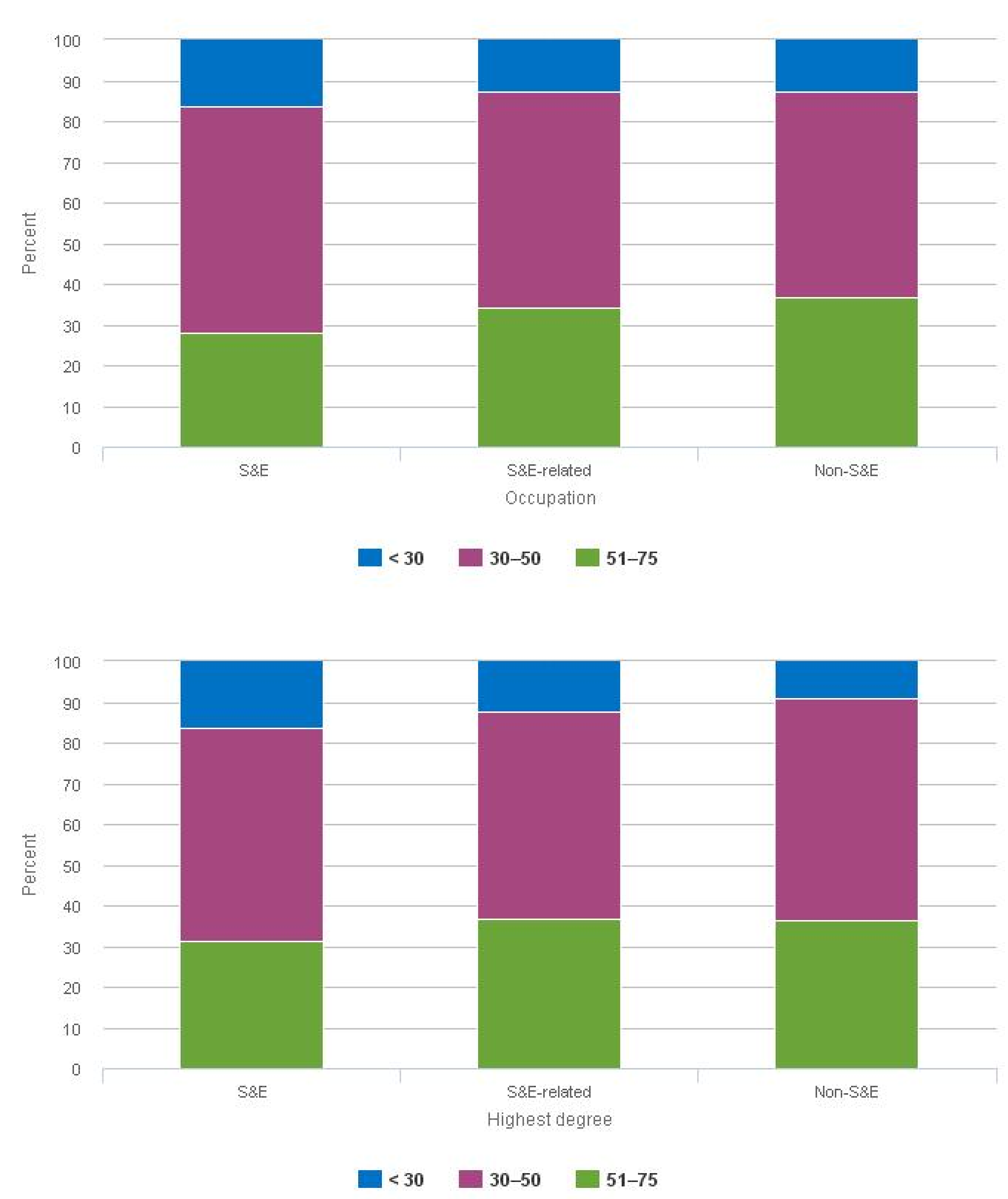
Science and Engineering Indicators 2016

Age Differences among Occupations

SESTAT respondents working in S&E occupations are younger than those in S&E-related or non-S&E occupations (Figure 3-24). In 2013, 28% of those in S&E occupations were between 51 and 75 years of age compared with 34% of those in S&E-related occupations and 37% of those in non-S&E occupations. The median age of the SESTAT population employed in S&E occupations was 41 years, compared to 44 years among those employed in S&E-related or non-S&E occupations. This may suggest, among other things, that as S&E workers age, they transition from S&E occupations to S&E-related or non-S&E occupations.

Figure 3-24

Age distribution of employed scientists and engineers, by broad occupational category and broad field of highest degree: 2013



NOTES: Scientists and engineers include those with one or more S&E or S&E-related degrees at the bachelor's level or higher or those who have only a non-S&E degree at the bachelor's level or higher and are employed in an S&E or S&E-related occupation. The Scientists and Engineers Statistical Data System (SESTAT) does not cover scientists and engineers over age 75.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, SESTAT (2013), http://sestat.nsf.gov.

Science and Engineering Indicators 2016

Age Differences among Degree Fields

Similar to the trend seen across broad occupational categories, S&E highest degree holders are generally younger than those holding highest degrees in S&E-related or non-S&E fields (Figure 3-24). In 2013, a smaller proportion of S&E highest degree holders (31%) than S&E-related (37%) or non-S&E (36%) highest degree holders were between 51 and 75 years of age. In addition, degree holders in different S&E fields varied in their ages. S&E highest degree holders in physical sciences, particularly the men in this group, were older than those in other broad S&E fields (Appendix Table 3-11). S&E highest degree holders in computer and information sciences, a relatively new field with rapid growth, were relatively young: only about 1 out of 5 were between 51 and 75 years of age.

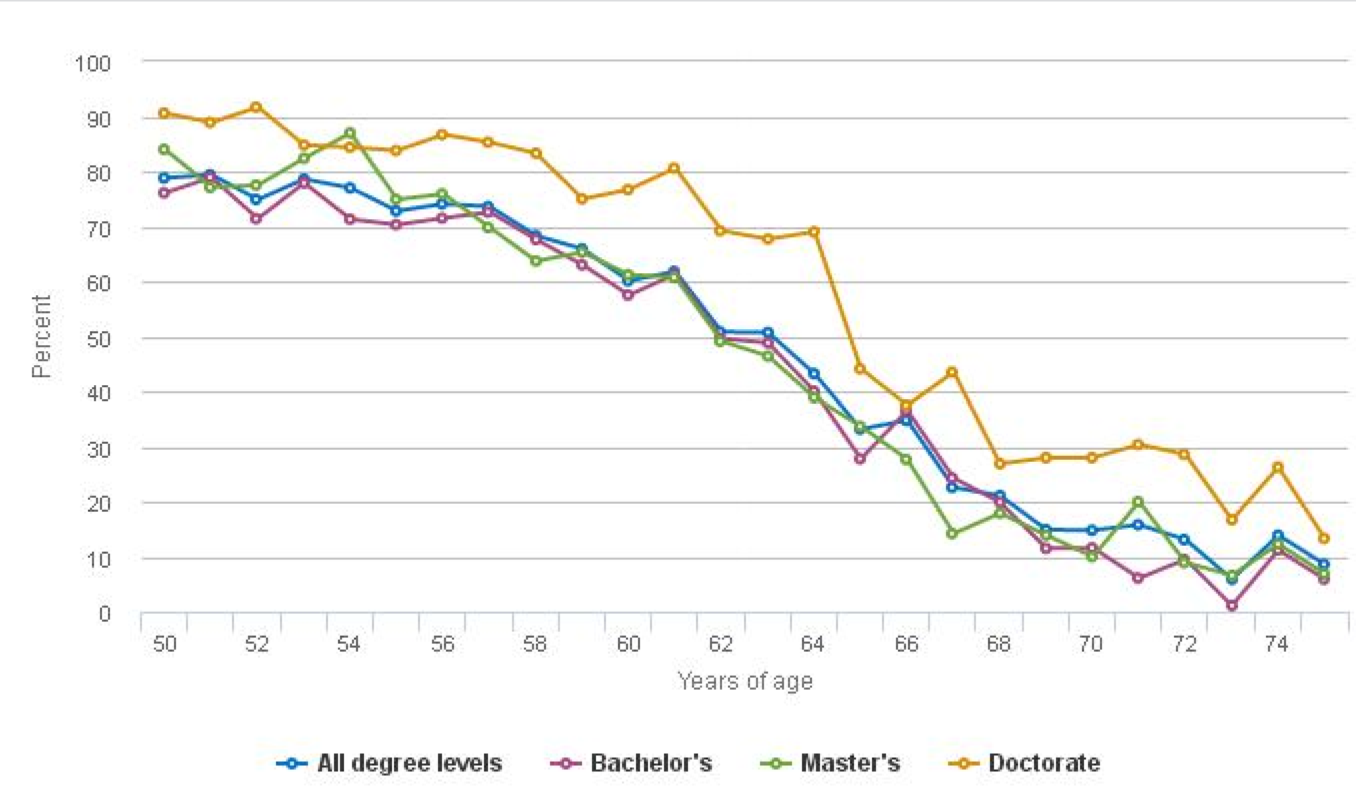
Within broad degree areas, the age profile of different degree fields varies (Appendix Table 3-11). For example, within life sciences degree fields, between 30% and 31% of highest degree holders in biological sciences and environmental life sciences were between 51 and 75 years of age compared with 47% of highest degree holders in agricultural and food sciences. In all broad S&E fields of highest degree except computer and mathematical sciences, women were younger than their male counterparts (Appendix Table 3-11).

Retirement

Trends in labor force participation among older individuals provide useful information about retirement patterns and how these patterns may have changed over time. Recent patterns of leaving the labor force and shifting to part-time work among older members of the workforce suggest that the labor force participation rate among scientists and engineers begins to decline sometime between the ages of 55 and 60 and is markedly reduced by the time workers reach their late 60s. One indication of the relationship between age and the level of labor force participation is illustrated by Figure 3-25, which shows the proportions of older scientists and engineers working full time. In 2013, at age 50, 79% of scientists and engineers worked full time (35 hours or more per week) in their principal job. Among individuals in their late-50s, this proportion dropped steeply. Among those in their mid-60s, for example, only about one-third worked full time. The overall pattern of declining full-time participation starting in individuals’ mid- to late-50s held at all degree levels, although doctorate holders generally worked full time at higher rates than bachelor’s degree holders.

Figure 3-25

Older scientists and engineers who work full time, by age and highest degree level: 2013



NOTES: All degree levels includes professional degrees not reported separately. Scientists and engineers include those with one or more S&E or S&E-related degrees at the bachelor's level or higher or those who have only a non-S&E degree at the bachelor's level or higher and are employed in an S&E or S&E-related occupation.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

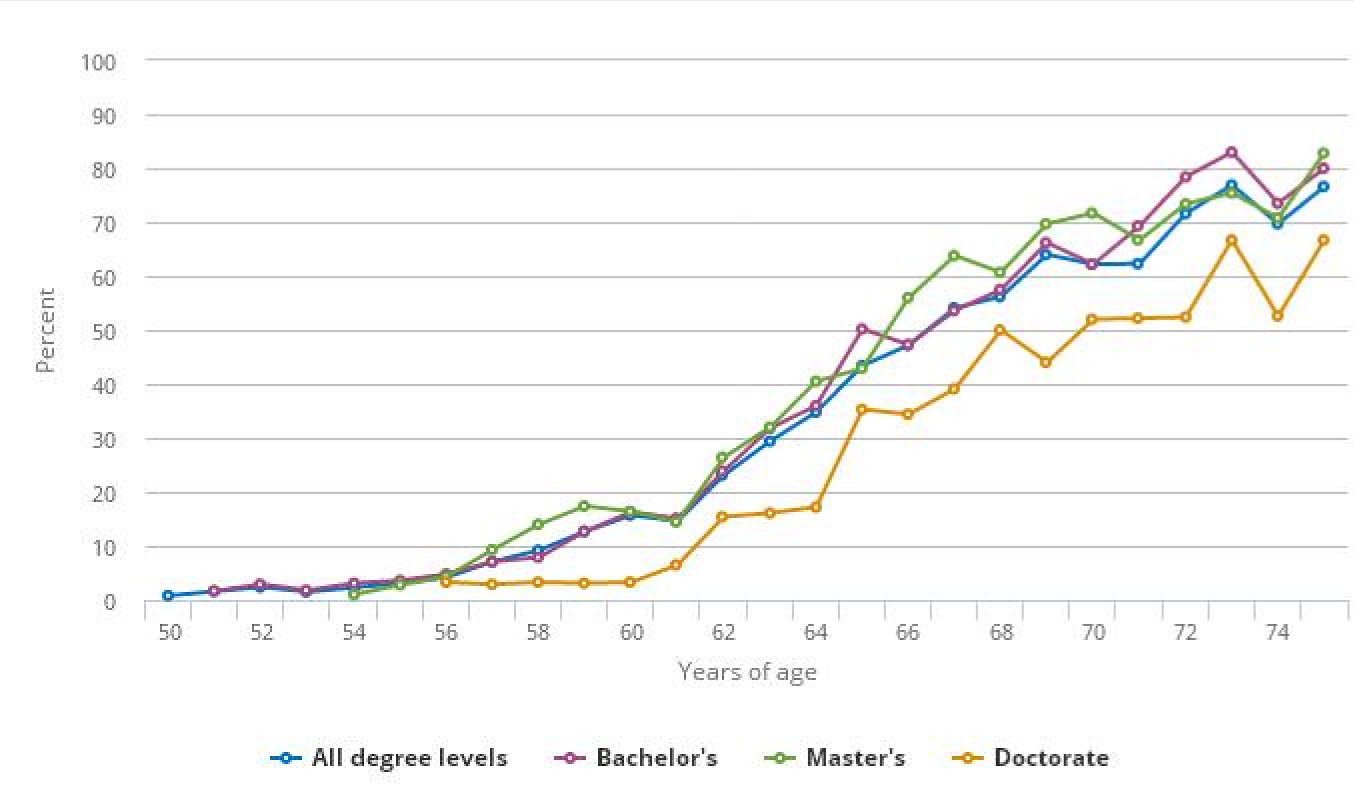
Science and Engineering Indicators 2016

Between 1993 and 2013, increasing proportions of scientists and engineers in their 60s reported still being in the labor force. Whereas 69% of those aged 60 to 64 were in the labor force in 1993, by 2013 this had risen to 74%. For those between the ages of 65 and 69, the proportion rose from 39% in 1993 to 48% in 2013.

Reasons provided for labor force nonparticipation or part-time work status also shed light on the relationship between age and retirement (Figure 3-26 illustrates the relationship between age and labor force nonparticipation because of retirement). In 2013, about 2.9 million scientists and engineers reported that they were out of the labor force because of retirement. The vast majority (90%) of retired individuals were 60–75 years of age. Individuals with doctorates typically reported lower rates of retirement than those without doctorates.

Figure 3-26

Older scientists and engineers who report not working because of retirement, by age and highest degree level: 2013



S = suppressed for reasons of confidentiality and/or reliability.

NOTES: All degree levels includes professional degrees not reported separately. Scientists and engineers include those with one or more S&E or S&E-related degrees at the bachelor's level or higher or those who have only a non-S&E degree at the bachelor's level or higher and are employed in an S&E or S&E-related occupation.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

Science and Engineering Indicators 2016

Retirement does not always mean that workers permanently leave the labor force. After nominally retiring from their jobs, some workers continue to work part time, work in a different capacity, or decide to return to the labor market at a later time. About 1.7 million employed scientists and engineers in 2013 reported that they had previously retired from a job. A total of 757,000 scientists and engineers working part time in 2013 reported their reason for working part time as having “previously retired or semi-retired.” Individuals who chose to stay in or return to the labor market following an occurrence of retirement were younger (median age 61) than those who were out of the labor force following retirement (median age 66).

Women and Minorities in the S&E Workforce

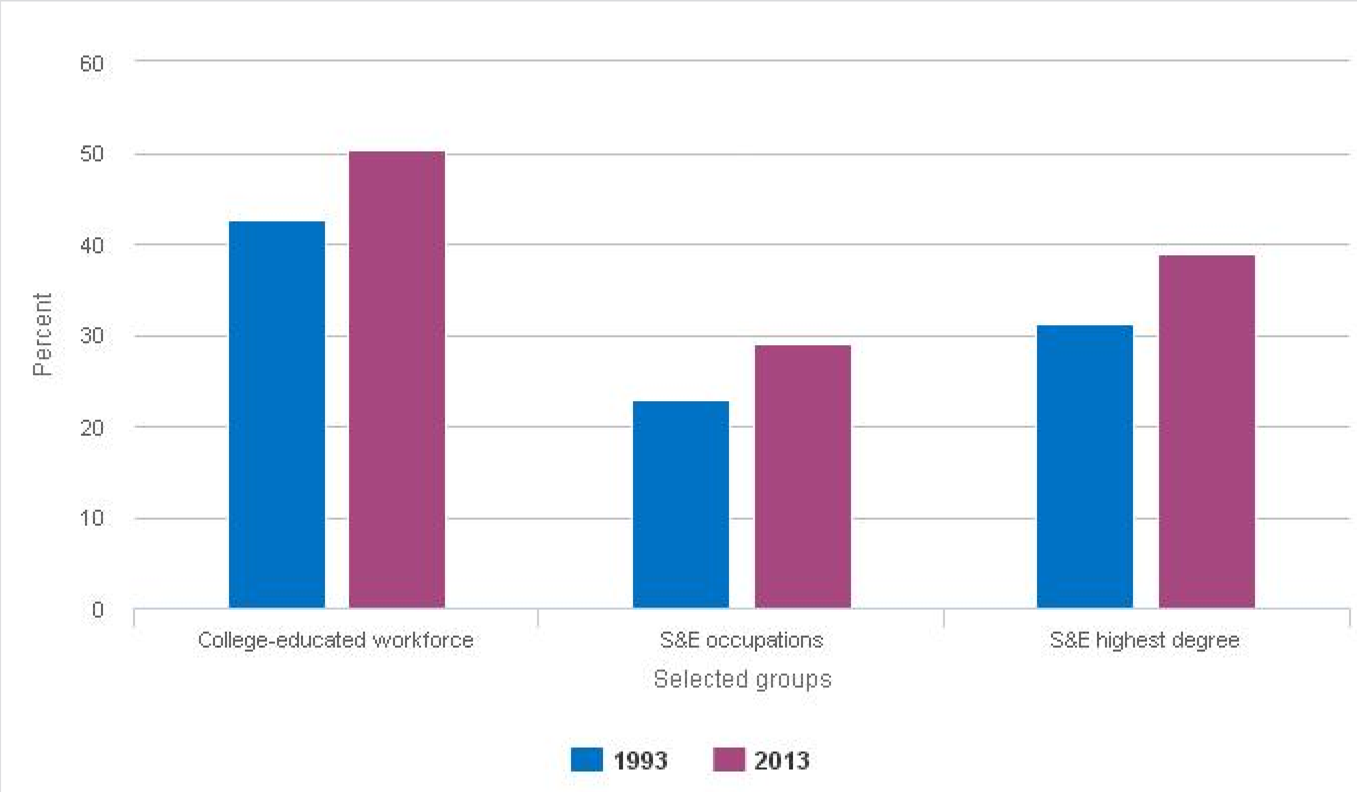
As researchers and policymakers increasingly emphasize the need for expanding S&E capabilities in the United States, many view demographic groups with lower rates of S&E participation as an underutilized source of human capital for S&E work. Historically, in the United States, S&E fields have had particularly low representation of women and members of several racial and ethnic minority groups (i.e., blacks, Hispanics, American Indians or Alaska Natives), both relative to the concentrations of these groups in other occupational or degree areas and relative to their overall representation in the general population. More recently, however, women and racial and ethnic minorities increasingly have been choosing a wider range of degrees and occupations. This section presents data on S&E participation among women and among racial and ethnic minorities. It also presents data on earnings differentials by sex and by race and ethnicity.

Women in the S&E Workforce

Historically, men have outnumbered women by wide margins with regards to both S&E employment and S&E training. Although the number of women in S&E occupations or with S&E degrees doubled over the past two decades, the disparity has narrowed only modestly. This imbalance is still particularly pronounced in S&E occupations. In 2013, women constituted only 29% of workers in these occupations, although they accounted for half of the college-educated workforce overall. Among S&E degree holders, the disparity was smaller but nonetheless significant with women representing 39% of employed individuals with a highest degree in S&E (Figure 3-27).

Figure 3-27

Women in the workforce and in S&E: 1993 and 2013



SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) and National Survey of College Graduates (NSCG) (1993, 2013), http://sestat.nsf.gov.

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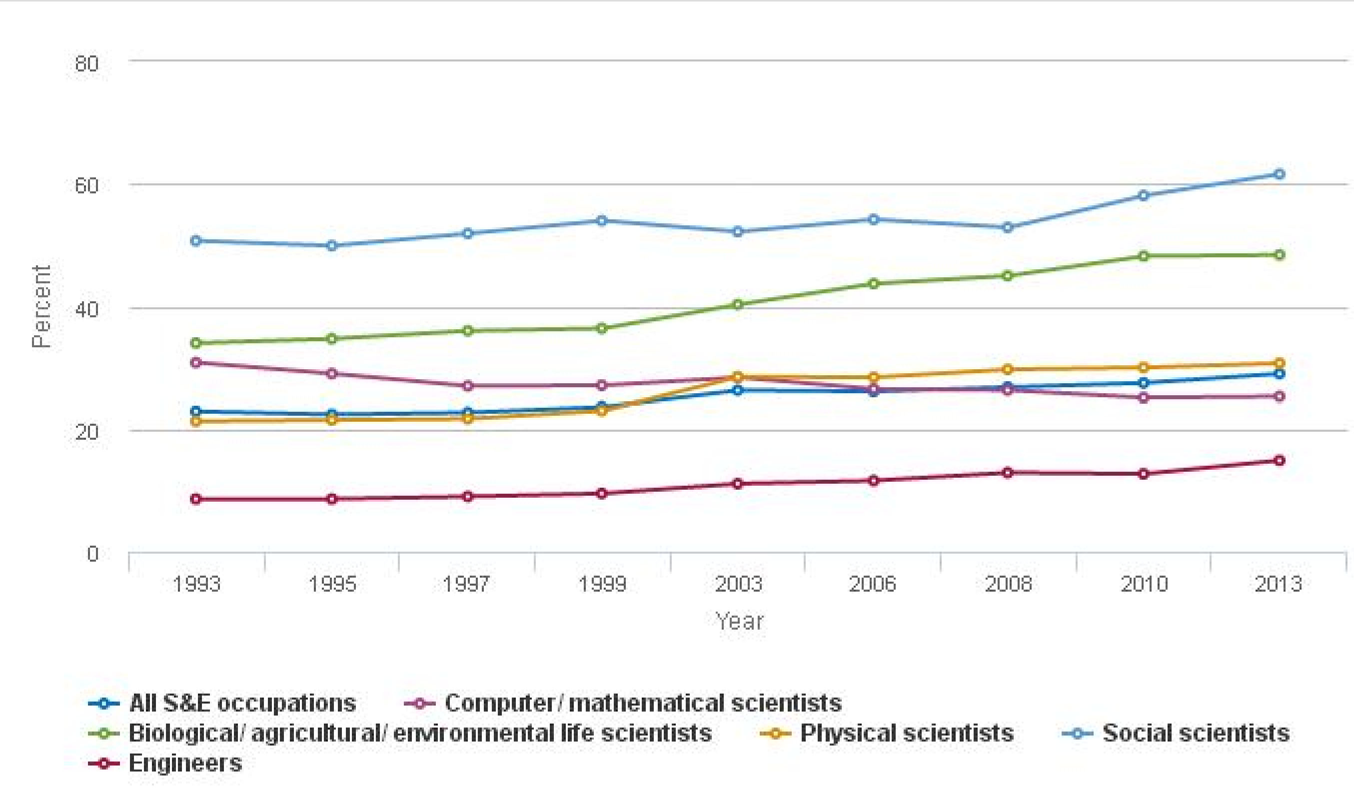
Women in S&E Occupations

Although women represented only 29% of individuals in S&E occupations in 2013, women's presence varies widely across S&E occupational fields (Appendix Table 3-12 and Figure 3-28). The percentage of female S&E workers continues to be lowest in engineering, where women constituted 15% of the workforce in 2013. Among engineering occupations with large numbers of workers, women accounted for only 8% of the workforce of mechanical engineers and about 11% to 12% of the workforce of electrical and computer hardware engineers and of aerospace, aeronautical, and astronautical engineers (Appendix Table 3-12).

Figure 3-28

Women in S&E occupations: 1993–2013



NOTE: National estimates were not available from the Scientists and Engineers Statistical Data System (SESTAT) in 2001.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, SESTAT (1993–2013), http://sestat.nsf.gov.

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Other disproportionately male S&E occupations include physical scientists (31% women) and computer and mathematical scientists (25% women). Within physical sciences occupations, physicists and astronomers have the largest imbalance (11% women). Within computer and mathematical sciences occupations, the largest component, computer and information scientists, has a smaller proportion of women (24%), compared with the mathematical scientists component, which is closer to parity (42% women).

In 2013, sex parity in S&E occupations was close among life scientists (48% women). The largest component of life sciences, biological and medical scientists, had reached gender parity (52% women). The field of social sciences was majority female (62%). Occupations within social sciences, however, varied widely: women accounted for 49% of economists but for 74% of psychologists. Psychologists, estimated at about 208,000 total workers in SESTAT (Appendix Table 3-12), represent an example of a large S&E occupation with substantially more women than men.

In contrast to jobs in S&E occupations, a majority of jobs in S&E-related occupations (56%) are held by women (Appendix Table 3-12). The largest component, health-related occupations, has a large share of women (69%) whose jobs are primarily as nurse practitioners, pharmacists, registered nurses, dietitians, therapists, physician assistants, and health technologists and technicians; women represented the vast majority of workers in these particular health occupations. In contrast, among health occupations such as diagnosing and treating practitioners, women accounted for a much smaller proportion (37%).

Since the early 1990s, the number of women working in each broad S&E occupational category has risen significantly (Figure 3-28). The rate of growth has been strong among life scientists, computer and mathematical scientists, and social scientists. These three broad S&E fields together employed 80% of women in S&E occupations in 2013, compared with 62% of men in S&E occupations. Between 1993 and 2013, the number of women nearly tripled among life scientists (an increase of 181%) and more than doubled among social scientists (an increase of 122%). The number of men also grew, but the rate of growth for women was greater than that for men, resulting in an increase in the proportion of female life scientists and female social scientists.

During the same period, the number of women in computer and mathematical sciences occupations also doubled (an increase of 120%). However, this new, rapidly growing and changing field attracted relatively more men than women (male participation grew 188%). The result has been an overall decline in the proportion of women from 31% to 25%. These trends make the gender disparity among computer and mathematical scientists second only to the gender disparity among engineers. However, the declining proportion of women in computer and mathematical sciences occupations does not extend to doctorate-level workers: Among those with a doctorate, the proportion of women increased, from 16% in 1993 to 21% in 2013.

During the past two decades, the proportion of women also increased among workers in engineering (from 9% to 15%) and in physical sciences (from 21% to 31%). In these two occupational categories, this increase was led by an expansion of women's numbers in the workforce (by 94% in engineering and 63% in physical sciences) while men's numbers barely changed between 1993 and 2013. (See sidebar Women in Leading Roles and Positions for a discussion on the presence of women in leading roles.)

Women in Leading Roles and Positions

This sidebar reports data from NSF's Scientists and Engineers Statistical Data System (SESTAT) on the presence of women in various types of leading roles, including management occupations, supervisory positions, and academic positions. Overall, the data indicate that men outnumber women in a wide range of leading roles despite the increasing presence of women in many of these positions.

Data from SESTAT indicate that women accounted for 31% of scientists and engineers employed in S&E management occupations in 2013 (Appendix Table 3-12). The gender imbalance was particularly pronounced among engineering managers (11% women), computer and information systems managers (24% women), and natural sciences managers (32% women). In contrast, a majority of medical and health services managers were women (55%). Among scientists and engineers employed as non-S&E managers, 27% were women, although the proportion of women in these jobs ranged from 25% among top-level managers, executives, and administrators (e.g., chief executive officer/chief operating officer/chief financial officer, president, district/general manager/provost) to 42% among education administrators (i.e., registrar, dean, principal).

Data from SESTAT also provide information on work activities in one's principal job. In 2013, women accounted for 37% of the 9 million scientists and engineers who reported supervising the work of others as part of their principal job, which reflects an increase since 1993 when the comparable proportion was 25%.

Data from the Survey of Doctorate Recipients (SDR) show a similar pattern among academically employed S&E doctorate holders. In 2013, women accounted for 29% of the tenured faculty positions held by U.S.-educated S&E doctorate holders. Women were closer to parity among tenure-track (but not yet tenured) faculty (42% women). The number of women in tenured or tenure-track positions has risen significantly in the past two decades. Between 1993 and 2013, the number of female science, engineering, and health (SEH) doctorate holders in such positions more than doubled (from about 27,000 to 62,000). The number of men in these positions also grew (by 5%), although not as fast as the number of women, resulting in an increase in the overall share of women among tenured positions (from 14% to 29%) and tenure-track positions (from 30% to 42%). However, the presence of women significantly varies across SEH fields. Life sciences, social sciences, psychology, and health fields generally have higher concentrations of female faculty than engineering, computer sciences, physical sciences, and mathematics. (See chapter 5 for additional details on academic employment of SEH doctorates.)

Additionally, data from the SDR show that in 2013 women accounted for 28% of SEH doctorate holders employed as an academic dean, department head, or department chair and for 34% of those employed as an academic president, provost, or chancellor.

Women among S&E Highest Degree Holders

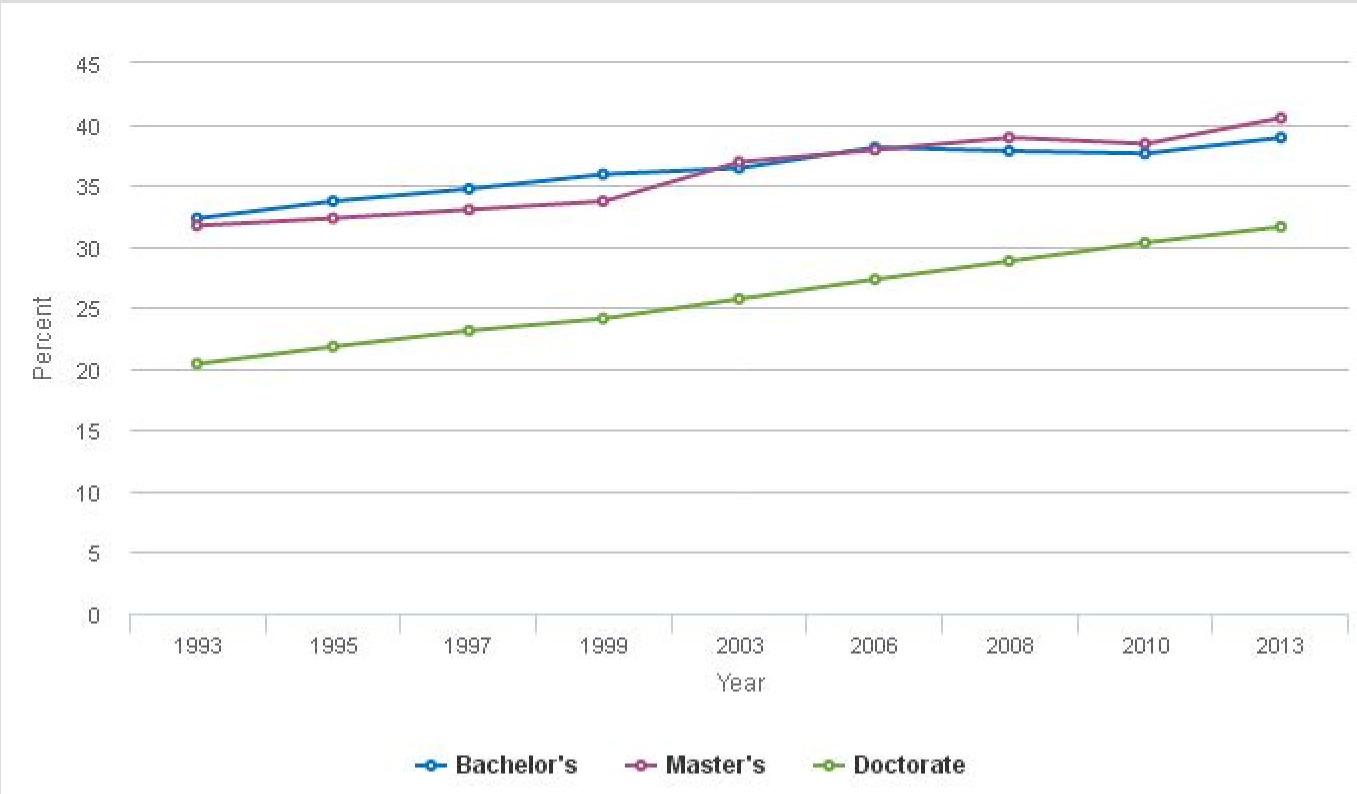
The sex disparity among employed S&E highest degree holders is less than the disparity among those in S&E occupations. In 2013, among individuals with a highest degree in an S&E field, women constituted 39% of those who were employed, up from 31% in 1993 (Figure 3-27). The pattern of variation in the proportion of men and women among degree fields echoes the pattern of variation among occupations associated with those fields (Appendix Table 3-13). In 2013, 55% of S&E highest degree holders in social sciences fields were women, as were 48% of those with a highest degree in the biological and related sciences. Men outnumbered women among computer sciences and mathematics highest degree holders (30% women) and among physical sciences highest degree holders (30% women). Disparities, however, were greatest among those with a highest degree in engineering (15% women).

In all broad fields except computer and mathematical sciences, the proportion of women in the workforce with associated highest degrees has been increasing since 1993. In computer and mathematical sciences, this proportion has declined as the number of women with a highest degree in the field has risen, but less rapidly than that of men in this new and rapidly growing field.

Sex differences are not limited to the field of degree, but also extend to the level of S&E degree. Overall, men outnumber women among S&E highest degree holders at the bachelor's, master's, and doctoral levels. The sex disparity is more severe among S&E doctorate holders than among S&E bachelor's or master's degree holders. For example, in 2013 women accounted for 39% and 41% of those whose highest degree in S&E was at the bachelor's and master's level, respectively, but 32% of those whose highest degree in S&E was at the doctoral level (Figure 3-29). Engineering was an exception: in this field, women represented a similar proportion (14%) of highest degree holders at the bachelor's and doctorate levels. However, for S&E fields overall at all three degree levels, the proportion of women has risen in the past two decades (Figure 3-29).

Figure 3-29

Employed women with highest degree in S&E, by degree level: 1993–2013



NOTE: National estimates were not available from the Scientists and Engineers Statistical Data System (SESTAT) in 2001.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, SESTAT (1993–2013), http://sestat.nsf.gov.

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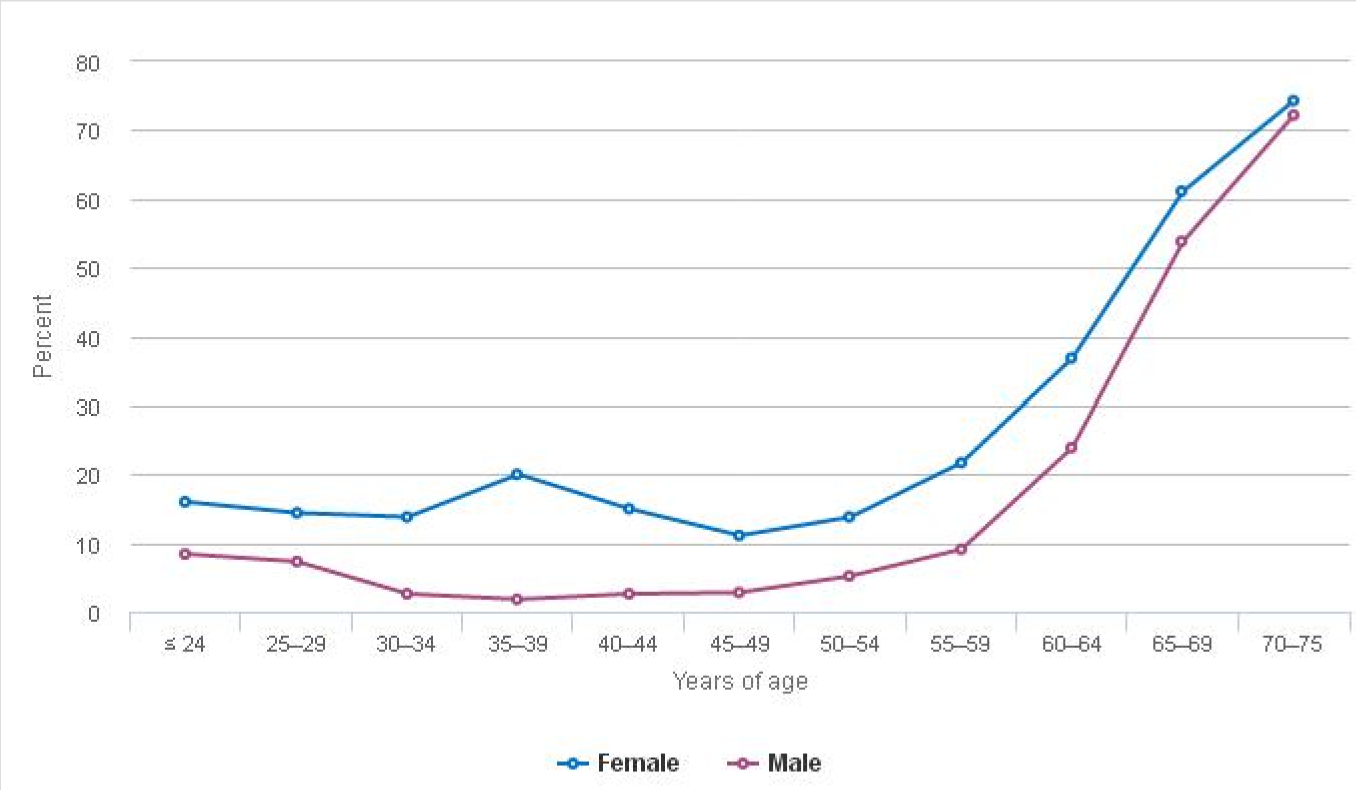
Working men and women with S&E highest degrees also differ in the extent to which they are employed in the same field as their S&E highest degree. This disparity is largely the result of women having a high concentration in the two degree areas—social sciences and life sciences—where degree holders most often work in an occupation outside of S&E. In 2013, these two broad fields accounted for nearly three-fourths (73%) of all employed women with S&E highest degrees, compared with 41% of all employed men with S&E highest degrees (Appendix Table 3-13).

Across all S&E degree areas, 19% of women with an S&E highest degree are employed in the S&E field in which they earned their highest degree compared with 31% of men (Appendix Table 3-14). However, the pattern varies by degree fields. Among life sciences and engineering degree holders, similar proportions of men and women are employed in the broad S&E field in which they earned their degree. Computer and mathematical sciences fields represent an exception in which a larger proportion of men (56%) than women (39%) work in an occupation that matches their broad degree field and a larger proportion of women (42%) than men (26%) work in non-S&E occupations. Among those with life sciences degrees, although a similar proportion of men (23%) and women (23%) work in their degree field, a larger proportion of women (32%) than men (18%) are employed in S&E-related occupations. The vast majority of social sciences degree holders work in non-S&E occupations, and this pattern is observed among both male (80%) and female (79%) degree holders.

Men and women with a highest degree in an S&E field also differ in their labor force nonparticipation rates. Compared with men, women were more likely to be out of the labor force (22% versus 14% for men). The difference in nonparticipation was particularly pronounced between the ages of 30 and 65 (Figure 3-30). In 2013, 19% of the women in this age group with an S&E highest degree were out of the labor force compared with 8% of the men. Many women in this group identified family reasons as an important factor: 39% of women reported that family was a factor for their labor force nonparticipation compared with 9% of men. Within this age range, women were also much more likely than men to report that they did not need to work or did not want to work (29% of women versus 16% of men). Men, on the other hand, were much more likely than women to cite retirement as a reason for not working (26% of women versus 48% of men).

Figure 3-30

Highest degree holders in S&E not in the labor force, by sex and age: 2013



NOTE: Not in the labor force includes those neither working nor looking for work in the 4 weeks prior to February 2013.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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Minorities in the S&E Workforce

The participation of underrepresented racial and ethnic minorities in the S&E workforce has been a concern of policymakers who are interested in the development and employment of diverse human capital to maintain the United States' global competitiveness in S&E. This section addresses the level of diversity in S&E by race and Hispanic ethnicity.[i] Like the preceding section, this section draws on data from NSF's SESTAT surveys to report on levels of S&E participation: first across occupations and then across the overall workforce with S&E degrees.

Whether defined by occupation, S&E degree, or a combination of the two, the majority of scientists and engineers in the United States are non-Hispanic whites. The next largest group of scientists and engineers are Asians. Several racial and ethnic minority groups, including blacks, Hispanics, and American Indians or Alaska Natives, have low levels of participation in S&E fields both compared with other groups and compared with their proportion in the population (Table 3-19).

[i] In this chapter, American Indian or Alaska Native, Asian, black, Native Hawaiian or Other Pacific Islander, white, and more than one race refer to individuals who are not of Hispanic origin. Hispanics may be any race.

Table 3-19 **Racial and ethnic distribution of U.S. residents, and of employed individuals in S&E occupations, with S&E degrees, and with college degrees: 2013**

(Percent)

Race and ethnicity	S&E occupations	S&E highest degree holders	College degree holders	U.S. residential population[a]
Total (*n*)	5,749,000	12,446,000	43,839,000	229,000,000
American Indian or Alaska Native	0.2	0.3	0.3	0.6
Asian	17.4	13.5	8.4	5.2
Black	4.8	5.8	7.2	11.7
Hispanic	6.1	7.9	7.7	14.6
Native Hawaiian or Other Pacific Islander	0.2	0.3	0.3	0.1
White	69.9	70.5	74.6	66.2
More than one race	1.5	1.6	1.5	1.6

NOTES: [a] Age 21 and older.
Hispanic may be any race. American Indian or Alaska Native, Asian, black or African American, Native Hawaiian or Other Pacific Islander, white, and more than one race refer to individuals who are not of Hispanic origin.

SOURCES: Census Bureau, American Community Survey (ACS) (2013); National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT), and National Survey of College Graduates (NSCG) (2013), http://sestat.nsf.gov.

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Race and Ethnicity Trends in S&E Occupations

In 2013, among the 5.7 million workers employed in S&E occupations, 70% were white, which is close to the proportion (66%) in the U.S. population age 21 and older (Table 3-19). However, S&E participation by whites varied across the broad S&E occupational categories, from 65% of computer and mathematical scientists to 78% of social scientists (Appendix Table 3-15). The concentration of whites in some occupations was more pronounced: they accounted for at least 90% of workers among forestry and conservation scientists, geologists and earth scientists, and political scientists.

Asians, with about 1 million workers in S&E occupations, accounted for 17% of S&E employment, much higher than their share of the U.S. population age 21 and older (5%). Asians had a large presence in computer and engineering fields, constituting 39% of computer software engineers, 25% of software developers, 29% of computer hardware engineers, 29% of bioengineers or biomedical engineers, and 26% of postsecondary teachers in engineering (Appendix Table 3-15). On the contrary, the proportion of Asians in social sciences occupations was much lower both compared with their participation in other S&E fields and compared with whites. For example, Asians accounted for just 7% of workers in social sciences occupations.

Overall, Hispanics accounted for 6% of employment in S&E occupations, which is lower than their share of the U.S. population age 21 and older (15%) (Table 3-19). Hispanics had a particularly large presence among psychologists (11%); mathematical scientists (11%); medical scientists (excluding practitioners) (8%); and industrial engineers (10%). Blacks accounted for 5% of S&E employment, which is lower than their share of the U.S. population age 21 and older (12%) (Table 3-19). Blacks had relatively high participation rates among computer systems analysts (11%), database administrators (13%), information security analysts (16%), and sociologists (10%).

Over the past two decades, the U.S. workforce in S&E occupations has become more diverse with increasing proportions of Asians, blacks, and Hispanics and a decreasing proportion of whites (Table 3-20). In 1993, 84% of workers in S&E occupations reported their race as white. By 2013, this proportion declined to 70%. Most of the decline in the proportion of whites during this period was offset by an increase in the proportion of Asians and, to a lesser degree, by increases in the proportion of other groups, particularly Hispanics.

Table 3-20 Distribution of workers in S&E occupations, by race and ethnicity: 1993–2013

(Percent)

Race and ethnicity	1993	1995	1997	1999	2003	2006	2008	2010	2013
American Indian or Alaska Native	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.2	0.2
Asian	9.1	9.6	10.4	11.0	14.2	16.1	16.9	18.5	17.4
Black	3.6	3.4	3.4	3.4	4.3	3.9	3.9	4.6	4.8
Hispanic	2.9	2.8	3.1	3.4	4.4	4.6	4.9	5.2	6.1
Native Hawaiian or Other Pacific Islander	NA	NA	NA	NA	0.3	0.5	0.4	0.2	0.2
White	84.1	83.9	82.9	81.8	75.2	73.2	71.8	69.9	69.9
More than one race	NA	NA	NA	NA	1.4	1.4	1.7	1.4	1.5

NA = not available.

NOTES: Hispanic may be any race. American Indian or Alaska Native, Asian, black or African American, Native Hawaiian or Other Pacific Islander, white, and more than one race refer to individuals who are not of Hispanic origin. Before 2003, respondents could not classify themselves in more than one racial and ethnic category, and Asian included Native Hawaiian and Other Pacific Islander.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (1993–2013), http://sestat.nsf.gov.

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Some of the changes by race over time may reflect changes to the way NSF and other federal government surveys collect information on this topic. After 2000, respondents to NSF surveys were able to report more than one race. Some of those who self-reported as white in the 1990s may have instead reported a multiracial identity after 2000 once they were given this option, which would decrease the estimated numbers of whites. However, because less than 2% of S&E workers reported a multiracial identity in years when that option was available, it is unlikely that this change contributed much to the decline in the proportion of whites between 1993 and 2013.

Racial and Ethnic Differences among S&E Degree Holders

Among those in the workforce whose highest degree is in S&E, the shares of racial and ethnic groups vary similarly across degree fields as they do in occupations (Table 3-21; Appendix Table 3-16). Compared to other broad S&E

fields, Asians have higher participation rates among those with degrees in engineering and in computer and mathematical sciences; blacks have higher participation rates among those with degrees in computer and mathematical sciences and in social sciences; Hispanics have slightly lower participation rates among those with degrees in computer and mathematical sciences and in physical sciences. Whites represent relatively smaller segments of degree holders in engineering and computer and mathematical sciences than in life, physical, and social sciences.

Table 3-21 **Racial and ethnic distribution of employed individuals with S&E highest degree, by field of highest degree: 2013**

(Percent)

Race and ethnicity	All S&E fields	Biological, agricultural, and environmental life sciences	Computer and mathematical sciences	Physical sciences	Social sciences	Engineering
Employed with highest degree in S&E (*n*)	12,446,000	1,896,000	2,197,000	731,000	4,764,000	2,859,000
American Indian or Alaska Native	0.3	0.3	0.1	0.7	0.3	0.2
Asian	13.5	12.0	20.9	16.1	6.2	20.3
Black	5.8	4.6	7.4	2.3	7.5	3.6
Hispanic	7.9	7.4	5.9	5.2	9.2	8.3
Native Hawaiian or Other Pacific Islander	0.3	S	0.1	0.1	0.5	0.2
White	70.5	73.7	64.2	74.1	74.3	66.1
More than one race	1.6	1.5	1.3	1.4	2.0	1.3

NOTES: S = suppressed for reasons of confidentiality and/or reliability.
Hispanic may be any race. American Indian or Alaska Native, Asian, black or African American, Native Hawaiian or Other Pacific Islander, white, and more than one race refer to individuals who are not of Hispanic origin.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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The demographic groups also differ in the level of their highest degree (Table 3-22), with Asians accounting for larger proportions of those whose highest degree is at the master's or doctoral level, relative to their counterparts with a highest degree at the bachelor's level. Conversely, blacks, Hispanics, and whites all represent larger proportions of those whose highest degree is at the bachelor's degree level, relative to those with a doctorate as their highest degree.

Table 3-22 **Racial and ethnic distribution of employed individuals with S&E highest degree, by level of highest degree: 2013**

(Percent)

Race and ethnicity	Bachelor's	Master's	Doctorate
Employed with highest degree in S&E (*n*)	8,932,000	2,596,000	873,000
American Indian or Alaska Native	0.3	0.1	0.2
Asian	10.5	20.6	23.7
Black	6.1	5.8	3.0
Hispanic	8.6	6.7	3.8
Native Hawaiian or Other Pacific Islander	0.4	0.2	0.1
White	72.3	65.1	68.3
More than one race	1.7	1.5	1.0

NOTES: Hispanic may be any race. American Indian or Alaska Native, Asian, black or African American, Native Hawaiian or Other Pacific Islander, white, and more than one race refer to individuals who are not of Hispanic origin.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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Asian S&E highest degree holders are more likely than those in other racial and ethnic groups to work in S&E occupations and to work in the area in which they earned their degree. Among black, Hispanic, and white S&E degree holders, between 21% and 26% work in their same broad field, compared to 36% among Asian S&E degree holders (Appendix Table 3-14).

Women in S&E by Race and Ethnicity

The rise in female participation in S&E over the past two decades was the result of increasing participation by members of all race and ethnic groups, although the growth among Asian and Hispanic women was particularly strong. Among workers in S&E occupations, the number of women who identified themselves as Asian or Hispanic increased at least fourfold between 1993 and 2013. As a result, both the Asian share and the Hispanic share of female workers in S&E occupations rose during this period (Table 3-23). The number of women employed in S&E occupations who reported themselves as black more than doubled (rising by 158%) between 1993 and 2013. In comparison, although the number of female workers who identified themselves as non-Hispanic white rose substantially (82%), their participation did not grow as steeply as members of other race and ethnic groups, resulting in an overall decline in the white share of female S&E workers over time (Table 3-23). A broadly similar pattern is observed among female S&E highest degree holders.

Table 3-23 **Racial and ethnic distribution of employed women in S&E occupations and with S&E highest degrees: 1993 and 2013**

(Percent)

	Women in S&E occupations		Women with S&E highest degrees	
Race and ethnicity	1993	2013	1993	2013
Total (*n*)	755,000	1,670,000	2,205,000	4,839,000
American Indian or Alaska Native	0.3	0.2	0.3	0.3

	Women in S&E occupations		Women with S&E highest degrees	
Race and ethnicity	1993	2013	1993	2013
Asian	9.3	17.7	7.3	12.2
Black	5.7	6.6	8.1	7.6
Hispanic	3.2	6.9	3.6	9.4
Native Hawaiian or Other Pacific Islander	NA	0.1	NA	0.3
White	81.5	66.9	80.6	68.3
More than one race	NA	1.4	NA	1.9

NA = not available.

NOTES: Hispanic may be any race. American Indian or Alaska Native, Asian, black or African American, Native Hawaiian or Other Pacific Islander, white, and more than one race refer to individuals who are not of Hispanic origin. In 1993, respondents could not classify themselves in more than one racial and ethnic category, and Asian included Native Hawaiian and Other Pacific Islander.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (1993, 2013), http://sestat.nsf.gov.

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Salary Differences for Women and Racial and Ethnic Minorities

Women and racial and ethnic minority groups generally receive less pay than their male and white counterparts (Table 3-24). However, salary differences between men and women were somewhat larger than salary differences among racial and ethnic groups (Table 3-24; Appendix Table 3-17 and Appendix Table 3-18). Overall, salary differences between men and women and among racial and ethnic groups remained largely unchanged between 1995 and 2013 (Table 3-24).

Table 3-24 **Median annual salary among S&E highest degree holders working full time, by sex, race, and ethnicity: 1995, 2003, and 2013**

(Dollars)

Characteristic	1995	2003	2013
All	44,000	60,000	72,000
Sex			
Female	34,000	45,000	55,000
Male	49,000	68,000	80,000
Race and ethnicity			
American Indian or Alaska Native	S	48,000	68,000
Asian	45,000	64,000	80,000
Black	35,000	48,000	58,000
Hispanic	38,000	50,000	59,000
Native Hawaiian or Other Pacific Islander	NA	56,000	78,000

Characteristic	1995	2003	2013
White	45,000	60,000	74,000
More than one race	NA	50,000	64,000

NA = not available; S = suppressed for reasons of confidentiality and/or reliability.

NOTES: Salaries are rounded to the nearest $1,000. Data for 1995 include some individuals with multiple races in each category. Hispanic may be any race. American Indian or Alaska Native, Asian, black or African American, Native Hawaiian or Other Pacific Islander, white, and more than one race refer to individuals who are not of Hispanic origin.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (1995, 2003, 2013), http://sestat.nsf.gov.

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Differences in average age, work experience, academic training, sector and occupation of employment, and other characteristics can make direct comparison of salary statistics misleading. Statistical models can estimate the size of the salary difference between men and women, or the salary differences between racial and ethnic groups, when various salary-related factors are taken into account. Estimates of these differences vary somewhat depending on the assumptions that underlie the statistical model used. The analyses presented in this section show that statistical models to control for effects of education, experience, and other factors on salaries tend to reduce, but not fully eliminate, the disparities. The remainder of this section presents estimated salary differences between men and women among individuals who are otherwise similar in age, work experience, field of highest degree, type of academic institution awarding highest degree (by Carnegie 2010 classification and private/public status), occupational field and sector, and other relevant characteristics that are likely to influence salaries. Data related to salary differences between minorities (American Indians or Alaska Natives, blacks, Hispanics, Native Hawaiians or Other Pacific Islanders, and those reporting more than one race) and Asians and whites are also included.

Accounting only for level of degree, women working full time whose highest S&E degree is at the bachelor's level earned 30% less than men (Figure 3-31).[i] The salary difference is smaller but substantial at both the master's level (28%) and the doctoral level (21%). The salary differences for non-Asian minorities relative to whites and Asians are narrower (Figure 3-32). On average, minority salary levels are 19% lower than those of whites and Asians at the bachelor's level, 20% lower at the master's level, and 16% lower at the doctoral level.

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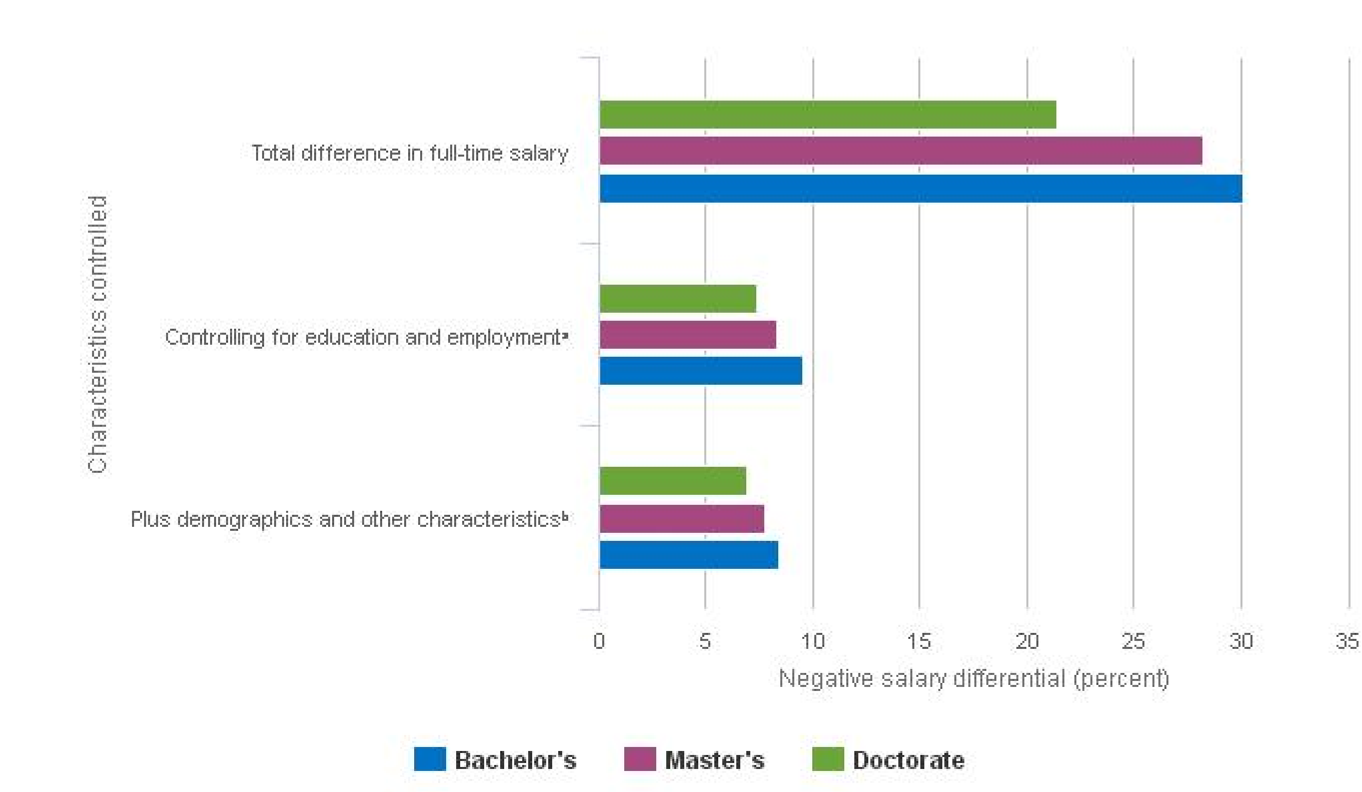
[i] Salary differences represent estimated percentage differences in women's reported full-time annual salary relative to men's reported full-time annual salary as of February 2013. Coefficients are estimated in an ordinary least squares regression model using natural log of full-time annual salary as the dependent variable. This estimated percentage difference in earnings differs slightly from the observed difference in median earnings by sex because the former addresses differences in mean earnings rather than median.

Figure 3-31

Estimated salary differences between women and men with highest degree in S&E employed full time, controlling for selected characteristics, by degree level: 2013



[a] Included are 20 Scientists and Engineers Statistical Data System (SESTAT) field-of-degree categories (out of 21 S&E fields), 38 SESTAT occupational categories (out of 39 categories), 6 SESTAT employment sector categories (out of 7 categories), years since highest degree, years since highest degree squared, Carnegie classification of school awarding highest degree, and private or public status of postsecondary institution awarding highest degree.

[b] In addition to the above education- and employment-related variables, the following indicators are included: nativity and citizenship, race and ethnic minority, marital status, disability, number of children living in the household, geographic region (classified into 9 U.S. Census divisions), and whether either parent holds a bachelor's or higher-level degree.

NOTES: Salary differences represent the estimated percentage difference in women's average full-time salary relative to men's average full-time salary. Coefficients are estimated in an ordinary least squares regression model using the natural log of full-time annual salary as the dependent variable and then transformed into percentage difference.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, SESTAT (2013), http://sestat.nsf.gov.

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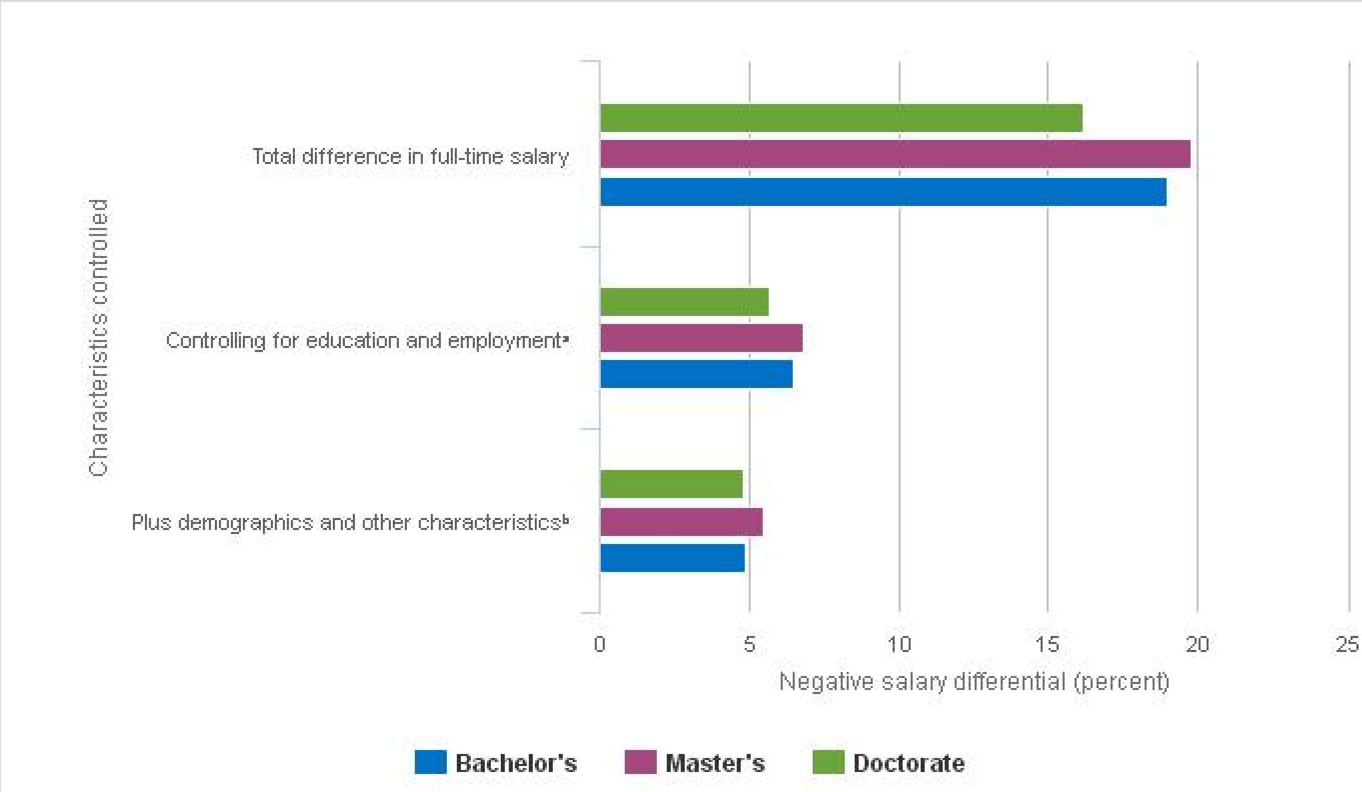
Figure 3-32

Estimated salary differences between minorities and whites and Asians with highest degree in S&E employed full time, controlling for selected characteristics, by degree level: 2013



[a] Included are 20 Scientists and Engineers Statistical Data System (SESTAT) field-of-degree categories (out of 21 S&E fields), 38 SESTAT occupational categories (out of 39 categories), 6 SESTAT employment sector categories (out of 7 categories), years since highest degree, years since highest degree squared, Carnegie classification of school awarding highest degree, and private or public status of postsecondary institution awarding highest degree.

[b] In addition to the above education- and employment-related variables, the following indicators are included: nativity and citizenship, sex, marital status, disability, number of children living in the household, geographic region (classified into 9 U.S. Census divisions), and whether either parent holds a bachelor's or higher-level degree.

NOTES: Salary differences represent the estimated percentage difference in the average full-time salary of minorities relative to the average full-time salary of whites and Asians. Coefficients are estimated in an ordinary least squares regression model using the natural log of full-time annual salary as the dependent variable and then transformed into percentage difference. Minorities include American Indian or Alaska Natives, blacks, Hispanics (of any race), Native Hawaiian or Other Pacific Islanders, and those reporting more than one race.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, SESTAT (2013), http://sestat.nsf.gov.

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Effects of Education, Employment, and Experience on Salary Differences

Salaries differ across degree field, occupational field and sector, and experience. Such differences in degree and occupational fields account for a portion of the salary differences by sex and by race and ethnicity. Median salaries in 2013 were generally higher among full-time workers with a highest degree in engineering ($91,000), physical sciences ($75,000), or computer and mathematical sciences ($84,000) than for those with a highest degree in life sciences ($57,000) or social sciences ($56,000). Degree areas with lower salaries generally have higher concentrations of women and of racial and ethnic minorities. Disproportionately larger shares of degree holders in life sciences, and particularly in social sciences, compared to other S&E degree fields, work in occupations not categorized as S&E, and the salaries for these occupations are generally lower than for S&E occupations (Appendix Table 3-17).

Salaries also differ across employment sectors. Academic and nonprofit employers typically pay less for similar skills than employers in the private sector, and government compensation generally falls somewhere between these two groups. These differences are salient for understanding salary variations by sex and by race and ethnicity because men, Asians, and whites are more highly concentrated in the private for-profit sector.

Salaries also vary by indicators of experience, such as age and years since completing one's degree. Because of the rapid increase in female participation in S&E fields in recent years, women with S&E degrees who are employed full time generally have fewer years of labor market experience than their male counterparts: the median number of years since highest degree is 13 for women versus 17 for men; the median age is 40 years for women versus 43 for men. Whites with S&E degrees who are employed full time also generally have more years of labor market experience than other racial and ethnic groups: the median number of years since highest degree is 18 years for whites, 14 years for Asians, 11 years for Hispanics, 12 years for blacks, 17 years for American Indians or Alaska Natives, and 16 years for Native Hawaiians or Other Pacific Islanders.

Eliminating the effects of differences in field of highest degree, degree-granting institution, field of occupation, employment sector, and experience,[ii] the estimated salary difference between men and women narrows by more than half (Figure 3-31). However, women still earn 10% less than men among individuals whose highest degree is at the bachelor's level, and 7%–8% less than men among individuals whose highest degree is at the master's or doctoral level. The pattern is similar among racial and ethnic groups: compared with whites and Asians, S&E highest degree holders in other racial and ethnic groups working full time earn 6%–7% less at each degree level (Figure 3-32).

Effects of Demographic and Other Factors on Salary Differences

Salaries vary by factors beyond education, occupation, and experience. For example, marital status, the presence of children, parental education, and other personal characteristics are often associated with salary differences. These differences reflect a wide range of issues, including, but not limited to, factors affecting individual career- and education-related decisions, differences in how individuals balance family obligations and career aspirations, productivity and human capital differences among workers that surveys do not measure, and possible effects of employer prejudice or discrimination. Salaries also differ across regions, partly reflecting differences in the cost of living across geographic areas.

However, adding such measures of personal and family characteristics[iii] to education, occupation, and experience results in only marginal changes in the estimated salary differences between men and women, and among racial and ethnic groups, compared with estimates that account for education, occupation, and experience alone. Women's adjusted salary differentials are 7% among S&E doctorates and 8% among S&E bachelor's degree and master's degree holders (Figure 3-31). Adjusted salary differences among racial and ethnic groups are 5% among bachelor's and doctoral degree holders and 6% among those with master's degrees (Figure 3-32).

The analysis of salary differences suggests that attributes related to human capital (fields of education and occupation, employment sector, and experience) are much more important than socioeconomic and demographic attributes in explaining the salary differences observed among S&E highest degree holders by sex and across racial and ethnic groups. Nonetheless, the analysis also shows that measurable differences in human capital do not entirely explain income differences between demographic groups.[iv]

Salary Differences among Recent Graduates

Salary differences among recent S&E graduates, particularly across racial and ethnic groups, are substantially narrower than in the population of S&E degree holders as a whole. Such employment metrics of recent graduates warrant particular attention as important indicators of current conditions in the labor market, particularly for young people considering S&E careers.

Substantially narrower salary differences among recent versus all S&E graduates, particularly across racial and ethnic groups, suggest that recent cohorts of S&E degree holders are getting closer to earnings parity than their older counterparts. For example, in 2013, among recent graduates who attained their highest degree in or after 2008, minorities working full time earned between 4% (at the bachelor's level) and 9% (at the doctorate level) less than Asians and whites. These salary differences are higher, ranging from 16% to 20%, among all S&E highest degree holders (regardless of graduation year) (Figure 3-32).

After accounting for differences in education, occupation, and experience, the salary differences for recently graduated minorities relative to whites and Asians are reduced among master's and doctoral degree holders (although a 3%–4% salary gap remains) and nearly attenuated among bachelor's degree holders. In contrast, when all S&E highest degree holders (regardless of graduation cohort) are included in the analysis, a 6%–7% salary gap at each degree level remains unexplained by these human capital attributes (Figure 3-32).

After controlling for differences in education, employment, demographic, and socioeconomic attributes, the gender salary gap among recent graduates ranges from 2% to 6% among master's and doctoral degree holders, and almost disappears among bachelor's degree holders. In comparison, a 7%–8% salary gap remains at each degree level among all S&E highest degree holders (regardless of graduation cohort).

[ii] Included are 20 SESTAT field of degree categories (out of 21 S&E fields), 38 SESTAT occupational categories (out of 39 categories), 6 SESTAT employment sector categories (out of 7), years since highest degree, years since highest degree squared, Carnegie classification of school awarding highest degree, and private/public status of postsecondary institution awarding highest degree.

[iii] In addition to the education- and employment-related variables, the following indicators are included: nativity and citizenship, marital status, disability, number of children living in the household, geographic region (classified into nine U.S. Census divisions), and whether either parent holds a bachelor's or higher level degree. The sex regression controls for racial and ethnic minority status, and the race and ethnicity regression controls for sex.

[iv] The regression analysis addresses major factors that affect differences in earnings but does not attempt to cover all possible sources of difference. For a more detailed discussion on the topic, see Blau and Kahn (2007), Mincer (1974), Polachek (2008), and Xie and Shauman (2003).

Immigration and the S&E Workforce

The industrialized nations of the world have long benefitted from the inflow of foreign-born scientists and engineers and the S&E skills and knowledge they bring. S&E skills are more easily transferrable across international borders than many other skills, and many countries have made it a national priority to attract international talent in S&E (NSB 2008). A large proportion of workers employed in S&E fields in the United States are foreign born. This section presents data on foreign-born scientists and engineers in the U.S. economy, including recent indicators of migration to the United States and the rate at which foreign-born recipients of U.S. doctoral degrees remain in the United States after earning their degree. Data from various sources, including NSF (SESTAT and Survey of Earned Doctorates [SED]), the Census Bureau, and the U.S. Citizenship and Immigration Services (USCIS) are discussed to study the immigrant S&E workforce in the United States.[i]

Foreign-born is a broad category, ranging from long-term U.S. residents with strong roots in the United States to recent immigrants who compete in global job markets and whose main social, educational, and economic ties are in their countries of origin. When interpreting data on foreign-born workers, the range of individuals in this category should be kept in mind.

Nationally representative survey data, such as SESTAT and ACS, although collected in different ways, yield broadly consistent estimates of the number of foreign-born scientists and engineers in the United States. In 2013, foreign-born individuals accounted for 27% of college-educated workers employed in S&E occupations in the United States (Table 3-25), which is higher than their representation in both the overall population (13%) and among all college graduates (15%). Both the number and proportion of foreign-born workers employed in S&E occupations in the United States have risen over time (Table 3-25).

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[i] For information on high-skill migration worldwide, see Defoort (2008), Docquier and Rapoport (2012), Docquier, Lowell, and Marfouk (2009), and Docquier and Marfouk (2006).

Table 3-25 Foreign-born workers in S&E occupations, by education level: 1993, 2003, and 2013

(Percent)

	1993	2003		2013	
Education	SESTAT	SESTAT	ACS	SESTAT	ACS
All college educated	15.8	22.6	25.2	26.5	26.9
Bachelor's	11.4	16.4	18.7	18.9	19.2
Master's	20.7	29.4	32.0	34.3	36.7
Doctorate	26.8	36.4	38.7	42.1	42.2

NOTES: ACS = American Community Survey; SESTAT = Scientists and Engineers Statistical Data System.
All college educated includes professional degree holders not broken out separately. The data from the ACS include all S&E occupations except postsecondary teachers of S&E because these occupations are not separately identifiable in the ACS data files.

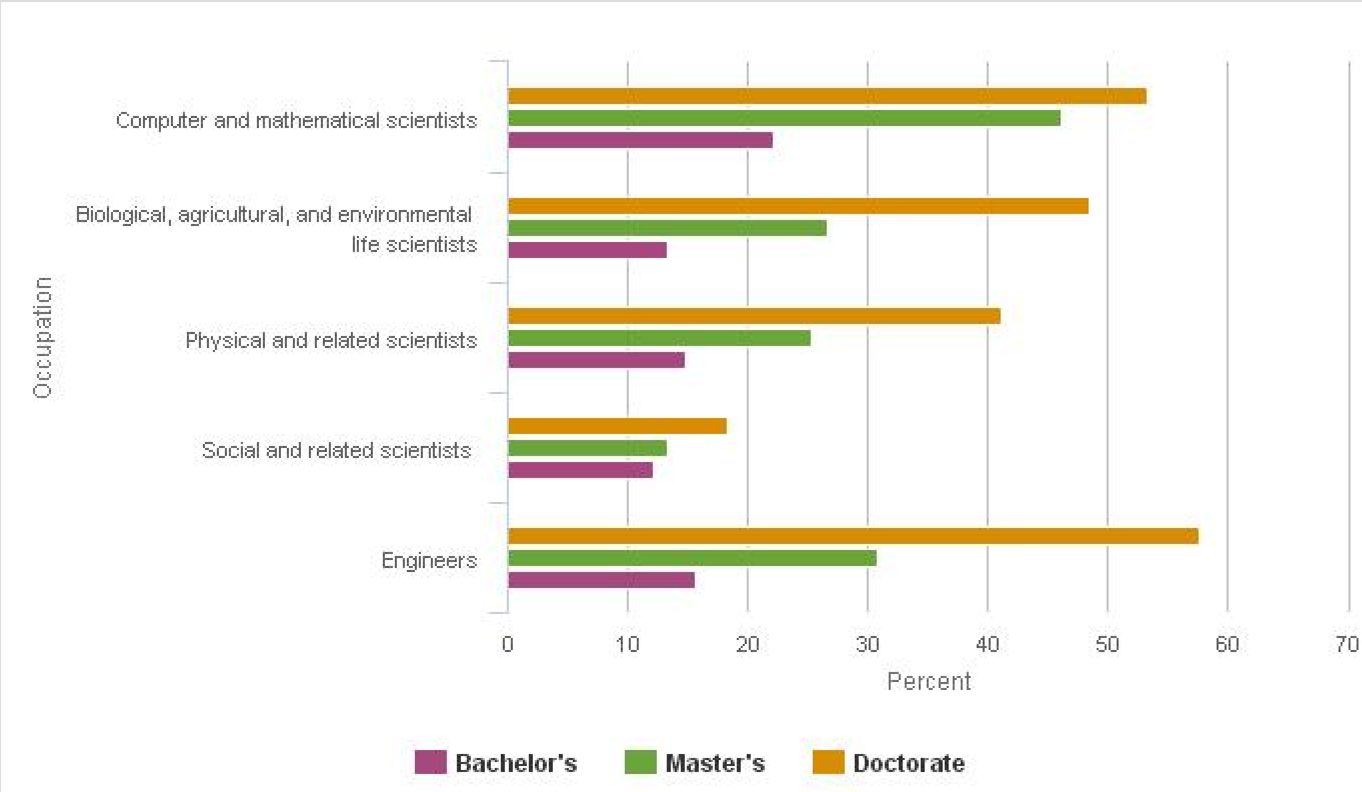
SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, SESTAT (1993, 2003, 2013), http://sestat.nsf.gov; Census Bureau, ACS Public Use Microdata Sample (PUMS) (2003, 2013).

Characteristics of Foreign-Born Scientists and Engineers

Foreign-born workers employed in S&E occupations tend to have higher levels of education than their U.S. native-born counterparts. Among individuals employed in S&E occupations, 20% of foreign-born workers have a doctorate, compared to 10% of U.S. native-born individuals in these occupations. In most S&E occupations, the higher the degree level, the greater the proportion of the workforce who are foreign born (Figure 3-33). This relationship is weakest among social scientists and strongest among computer and mathematical scientists and engineers. In 2013, at the bachelor's degree level, the proportion of foreign-born individuals in S&E occupations ranged from 12% (social scientists) to 22% (computer and mathematical scientists). However, at the doctoral level, over 40% were foreign born in each S&E occupation except social sciences.

Figure 3-33

Foreign-born scientists and engineers employed in S&E occupations, by highest degree level and broad S&E occupational category: 2013



SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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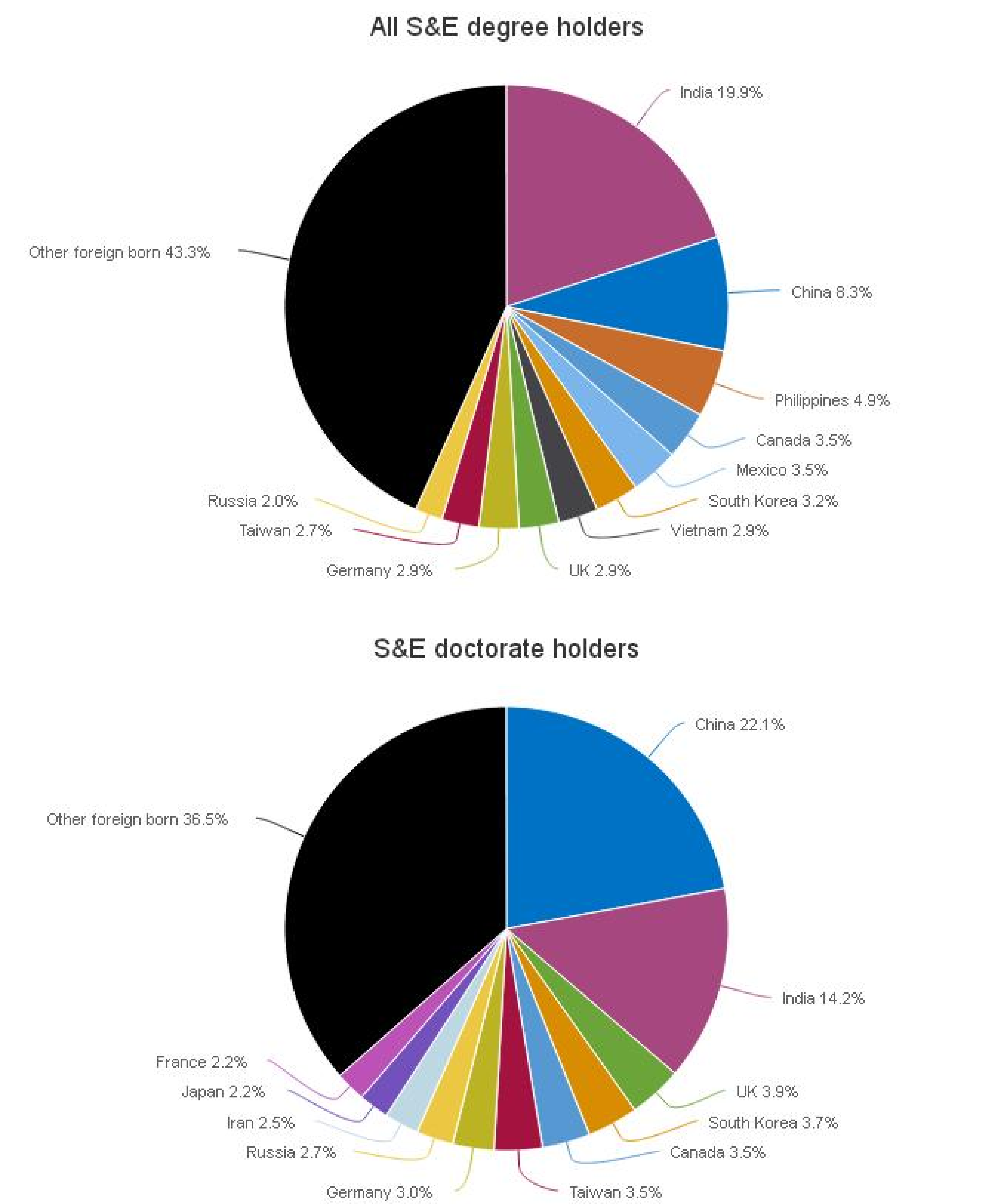
In 2013, among SESTAT respondents employed in S&E occupations, foreign-born workers (median age 39 years) were younger than their native-born counterparts (median age 42). The distribution by sex was largely similar across foreign-born (28% female) and native-born (29% female) workers in S&E occupations. Asians accounted for 59% of foreign-born workers in S&E occupations but for only 3% of U.S. native-born workers in these occupations (Appendix Table 3-19). In comparison, whites represented 27% of foreign-born workers in S&E occupations but 86% of native-born workers in these occupations. Nearly 90% of all Asians employed in S&E occupations were foreign born.

In 2013, 57% of foreign-born individuals in the United States with an S&E highest degree were from Asia; another 20% were from Europe. North and Central America, the Caribbean, South America, and Africa each supplied 4% to 6% of the foreign-born S&E highest degree holders in the United States. In 2013, the leading country of origin among these immigrants was India, which accounted for 20% of the foreign-born S&E degree holders in the United States (Figure 3-34). With less than half the total for India, China was the second leading country with 8%. Source countries for the 402,000 foreign-born holders of S&E doctorates were somewhat more concentrated, with China providing a higher proportion (22%) than India (14%). These patterns by source region and country for foreign-born S&E highest degree holders in the United States have been stable since at least 2003.

Figure 3-34

Foreign-born individuals with highest degree in S&E living in the United States, by place of birth: 2013



UK = United Kingdom.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2013), http://sestat.nsf.gov.

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The SESTAT surveys ask respondents to provide information on where they received their postsecondary degrees and their motivation for coming to the United States. This information sheds light on the educational and career paths of foreign-born scientists and engineers in the United States and possible factors that influence these paths. The majority of foreign-born scientists and engineers in the United States received their initial university training abroad. In 2013, there were about 4.6 million college-educated, foreign-born scientists and engineers employed in the United States; of these, 2.2 million received their first bachelor's degree abroad. Many of these individuals came to the United States for job or economic opportunities (32%), family-related reasons (27%), or educational opportunities (21%). In contrast, only 6% of foreign-born scientists and engineers with a U.S. bachelor's degree cited job or economic opportunities, and many more cited family-related reasons (42%) or educational opportunities (23%) as their primary reasons for coming to the United States.

A substantial number of foreign-born scientists and engineers in the United States appear to come here for further higher education after receiving their initial university training abroad. Nearly two-thirds (63%) of the 1.1 million employed foreign-born scientists and engineers who received their initial university training abroad and who hold a master's degree, doctorate, or professional degree completed their highest degree in the United States. Among these individuals, the most frequently cited reason for coming to the United States was educational opportunities (43%). Family-related reasons (12%) and job/economic opportunities (12%) were cited by much smaller proportions. Among the foreign-born doctorate holders employed in the United States, 65% received this degree from a U.S. institution.

New Foreign-Born Workers

During the 2007–09 economic downturn, two indicators—the number of temporary work visas issued by the U.S. government in visa classes for high-skill workers and the stay rates of foreign-born U.S. doctorate recipients—showed evidence that the volume of new foreign-born workers entering the U.S. S&E workforce might be declining. However, recent data indicate that this period of decline was temporary. In addition to these two indicators, this section discusses characteristics of workers with temporary work visas and country profiles of new foreign-born workers.

Temporary Visas

The number of temporary work visas issued for high-skill workers provides an indication of new immigrant workers entering the U.S. labor force.[i] After several years of growth, the largest classes of these temporary visas declined during the recent economic downturn (Figure 3-35). Despite the increases in the issuance of temporary visas since FY 2009, the total numbers of visas issued in some categories have not yet reached the recent highs seen in FY 2007, before the beginning of the economic downturn (Figure 3-35). A decline in the issuance of these visas, particularly H-1B visas, had also occurred around the more mild recession in 2001.

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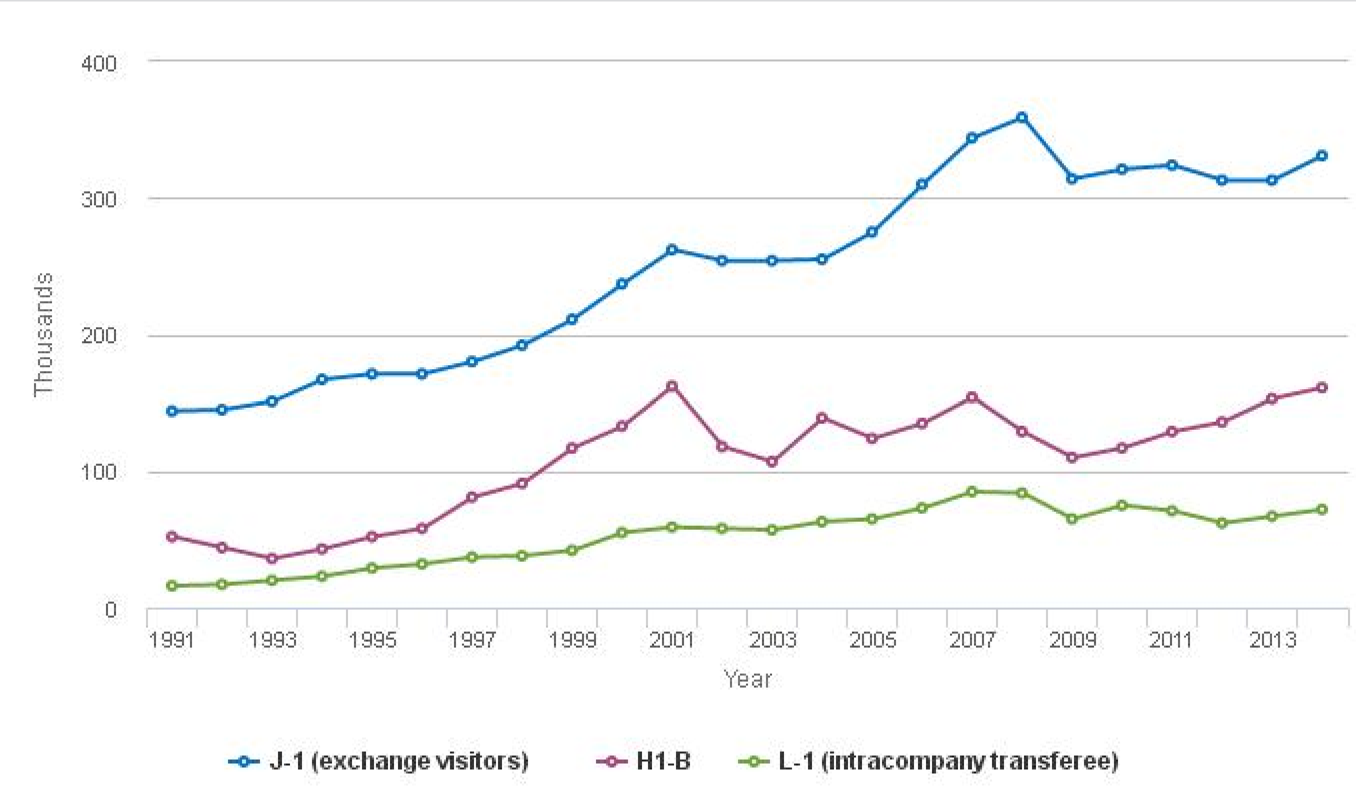
[i] For all types of temporary work visas, the actual number of individuals using them is less than the number issued. For example, some individuals may have job offers from employers in more than one country and may choose not to foreclose any options until a visa is certain.

Figure 3-35

Temporary work visas issued in categories with many high-skilled workers: FYs 1991–2014



NOTE: J-1 exchange visitor visa is used for many different skill levels.

SOURCES: U.S. Department of State, Nonimmigrant Visa Issuances by Visa Class and by Nationality and Nonimmigrant Visas by Individual Class of Admission, http://travel.state.gov/content/visas/english/law-and-policy/statistics.html (accessed 18 August 2015).

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H-1B visas account for a significant proportion of foreign-born high-skill workers employed by U.S. firms on temporary visas. This type of visa is issued to individuals who seek temporary entry into the United States in a specialty occupation that requires professional skills. It is issued for up to 3 years with the possibility of an extension to 6 years. In 2014, the United States issued about 161,000 H-1B visas, up 46% from the recent low in 2009 (110,000) and higher than the recent peak in 2007 (154,000) (Figure 3-35).

Issuance of visas in other temporary work categories that usually contain large numbers of high-skill workers has also risen since 2009; however, the H-1B visa category has shown continued increase since 2009, unlike certain other visa classes such as the J-1 and L-1 categories (Figure 3-35).

Characteristics of H-1B Visa Recipients

The majority of H-1B visa recipients work in S&E or S&E-related occupations. However, precise counts of H-1B visas issued to individuals in these occupations cannot be obtained because USCIS does not classify occupations with the same taxonomy used by NSF. In FY 2014, workers in computer-related occupations as classified by USCIS were the most common recipients of H-1B visas, accounting for 65% of new H-1B visas issued (Appendix Table 3-20). The total number of newly initiated H-1B visas for workers in computer-related fields has increased substantially since 2010, following a steep decline between 2008 and 2009 during the economic downturn (DHS USCIS 2010, 2012, 2013, 2015). The proportion of H-1B recipients who worked in computer sciences was considerably lower in the earlier part of the 2000s. For example, in 2002, only 25% of H-1B visa recipients worked in computer-related fields (NSB 2012).

H-1B visa recipients tend to possess a bachelor's or higher level degree. In FY 2014, nearly half of new H-1B visa recipients (46%) had a bachelor's degree; the rest (54%) had an advanced degree, including 41% with a master's degree, 3% with a professional degree, and 10% with a doctorate (DHS USCIS 2015). In FY 2014, 66% of new H-1B visa recipients were from India, and 11% were from China (DHS USCIS 2015). The preponderance of advanced degrees notwithstanding, H-1B visa recipients were relatively young. In FY 2014, 42% of new H-1B visa recipients were between the ages of 25 and 29, and 31% were between the ages of 30 and 34 (DHS USCIS 2015).

Table 3-26 shows the starting salaries of new recipients of H-1B visas by occupation group. These starting salaries are reported by employers in the final visa application forms sent to USCIS and differ from the H-1B salaries that firms report earlier in the process on their applications to the Department of Labor. The relatively low median salaries for workers in life sciences may reflect the use of H-1B visas to hire individuals for relatively low-paying postdoc positions.

Table 3-26 **Annual salaries for new H-1B visa recipients, by occupation: FY 2014**

(Dollars)

Occupation	Median	Mean
Administrative specializations	57,000	67,000
Architecture, engineering, and surveying	75,000	80,000
Art	52,000	60,000
Computer-related occupations	67,000	74,000
Education	52,000	64,000
Entertainment and recreation	41,000	59,000
Law and jurisprudence	90,000	108,000
Life sciences	50,000	57,000
Managers and officials	90,000	101,000
Mathematics and physical sciences	70,000	75,000
Medicine and health	66,000	112,000
Miscellaneous professional, technical, and managerial	75,000	85,000
Museum, library, and archival sciences	48,000	60,000
Religion and theology	36,000	39,000
Social sciences	65,000	76,000
Writing	44,000	50,000

SOURCE: Department of Homeland Security (DHS), U.S. Citizenship and Immigration Services; *Characteristics of H-1B Specialty Occupation Workers, Fiscal Year 2014 Annual Report to Congress (February 26, 2015)*, http://www.uscis.gov/sites/default/files/USCIS/Resources/Reports%20and%20Studies/H-1B/h-1B-characteristics-report-14.pdf, accessed 7 May 2015.

Short-Term Stay Rates for U.S. S&E Doctorate Recipients

Among doctorate recipients, the period immediately after earning their doctorate is a pivotal point that can substantially affect long-term career trajectories. During this period, foreign-born doctorate recipients who remain in the United States may set themselves on a path to long-term residency.

At the time they receive their doctorates, foreign-born students at U.S. universities report whether they intend to stay in the United States and whether they have a firm offer to work in the United States (either a postdoc or a job) the following year.[i] These responses provide estimates of short-term stay rates.[ii]

Most foreign-born noncitizen recipients of U.S. S&E doctorates (including those on temporary and permanent visas) plan to stay in the United States after graduation (Figure 3-36). According to the most recent estimates, at the time of doctorate receipt, 75% of foreign-born noncitizen recipients of U.S. S&E doctorates planned to stay in the United States, and 44% had either accepted an offer of postdoc study or employment or were continuing employment in the United States. Both of these proportions have risen since the 1980s. In 1993, 65% planned to stay in the United States after graduation, and 33% said they had firm offers in hand. Throughout the 1980s, these proportions were about 50% and 33%, respectively (NSB 2012).

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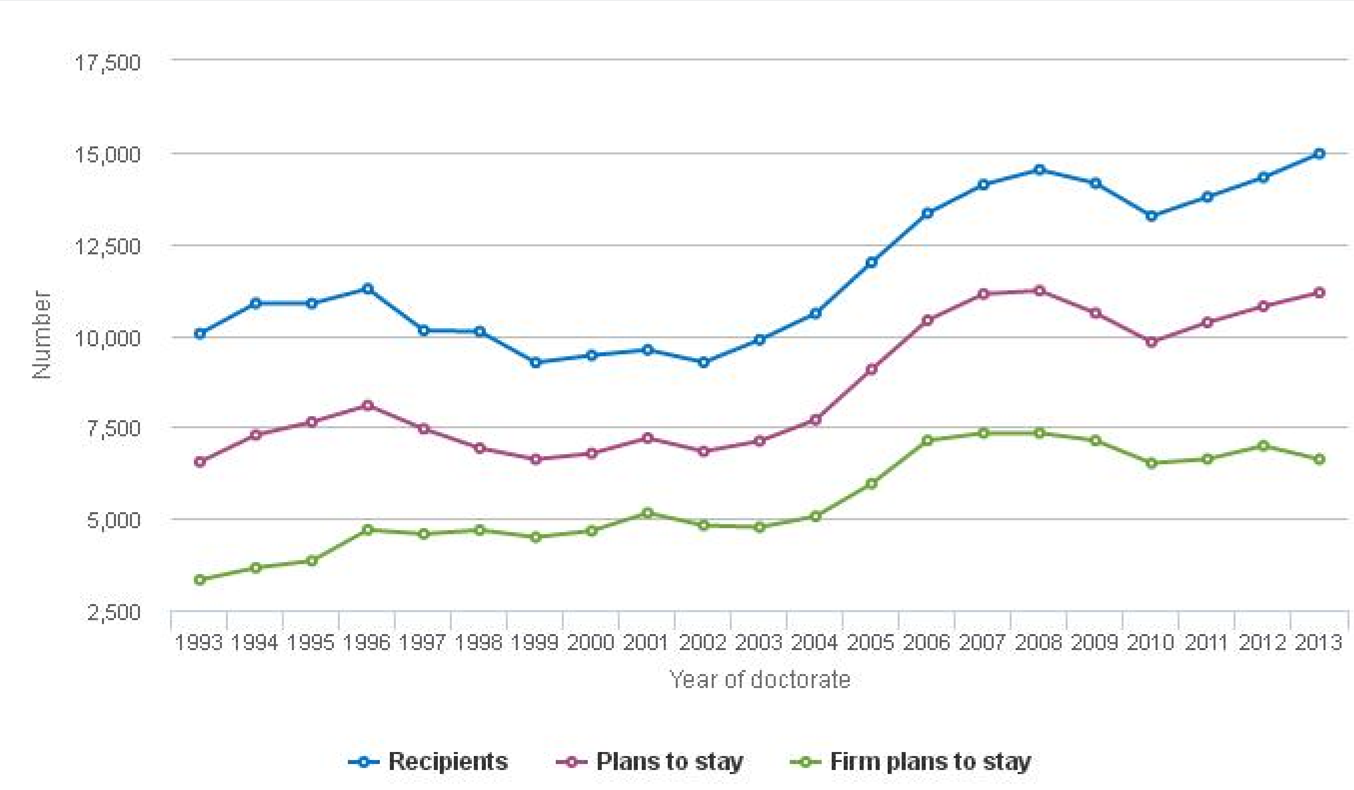
[i] This question is part of the SED, which is administered to individuals receiving research doctoral degrees from all accredited U.S. institutions. For information on the SED, see http://www.nsf.gov/statistics/srvydoctorates/. The information on plans to stay or definite commitments to stay reflects intentions within the year after graduation as reported by the doctorate recipients around their graduation date. As such, any changes in intentions after survey completion are not captured.

[ii] Many foreign recipients of U.S. doctorates who report that they plan to stay in the United States the year after graduation may do so using their student (F-1) visa and never obtain a new visa that would permit a longer stay. Student visas permit an additional 12-month stay in the United States after graduation if a student applies for optional practical training (OPT). OPT refers to paid or unpaid work that is performed at least 20 hours a week and that is related to a student's field of study. Starting in April 2008, those earning a degree in STEM fields could apply for an extension of their OPT to a total of 29 months. Data from the Department of Homeland Security's Student and Exchange Visitor Information System show that 68% of students with F-1 visas completing a doctorate in any field between 1 November 2013 and 31 October 2014 had applied for OPT.

Figure 3-36

Plans at graduation of foreign recipients of U.S. S&E doctoral degrees to stay in the United States, by year of doctorate: 1993–2013



NOTE: Data include foreign doctorate recipients on temporary and permanent visas and also those with unknown visa status.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations of the Survey of Earned Doctorates (SED) (1993–2013).

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Although stay rates have risen over the long haul, they have fluctuated within a relatively narrow range since the beginning of the 2000s (Figure 3-36 and Appendix Table 3-21). Among foreign-born S&E doctorate recipients, both the percentage reporting plans to stay in the United States and the percentage reporting firm offers to stay declined approximately since 2006, a period marked by the onset of the economic downturn and its aftermath. The overall number of foreign-born S&E doctorate recipients also declined in 2009 and 2010, although the numbers have since risen and the 2013 level exceeded the recent peak seen in 2008.

Overall, S&E short-term stay rates reflect the high short-term stay rates in mathematics and computer science, biological sciences, physical and earth sciences, and engineering (Appendix Table 3-21). According to the most recent estimates, the short-term stay rates in these four fields ranged from 77% to 82%, as measured by reports of intentions to stay in the United States. However, the short-term stay rates for foreign-born U.S. S&E doctorate recipients in health fields (70%) were somewhat lower, and those in social sciences (56%) were substantially lower. The proportion of foreign S&E doctorate recipients reporting firm offers to work showed a similar pattern across doctorate fields.

Stay rates vary by place of origin. Between 2010 and 2013, the vast majority of U.S. S&E doctorate recipients from China (84%) and from India (86%) reported plans to stay in the United States, and close to 55% of these individuals reported accepting firm offers for employment or postdoc research in the United States (Appendix Table 3-21). U.S. S&E doctorate recipients from Japan, South Korea, and Taiwan were less likely than those from China and India to stay in the United States. No more than half of U.S. S&E doctorate recipients from Turkey, Germany, and Italy had firm plans to stay in the United States after graduation. In North America, the percentage of U.S. S&E doctorate recipients who had definite plans to stay in the United States was higher for those from Canada than for those from Mexico.

Among U.S. S&E doctorate recipients from the two top countries of origin, China and India, the proportions reporting plans to stay in the United States have declined since the early 2000s (Appendix Table 3-21).

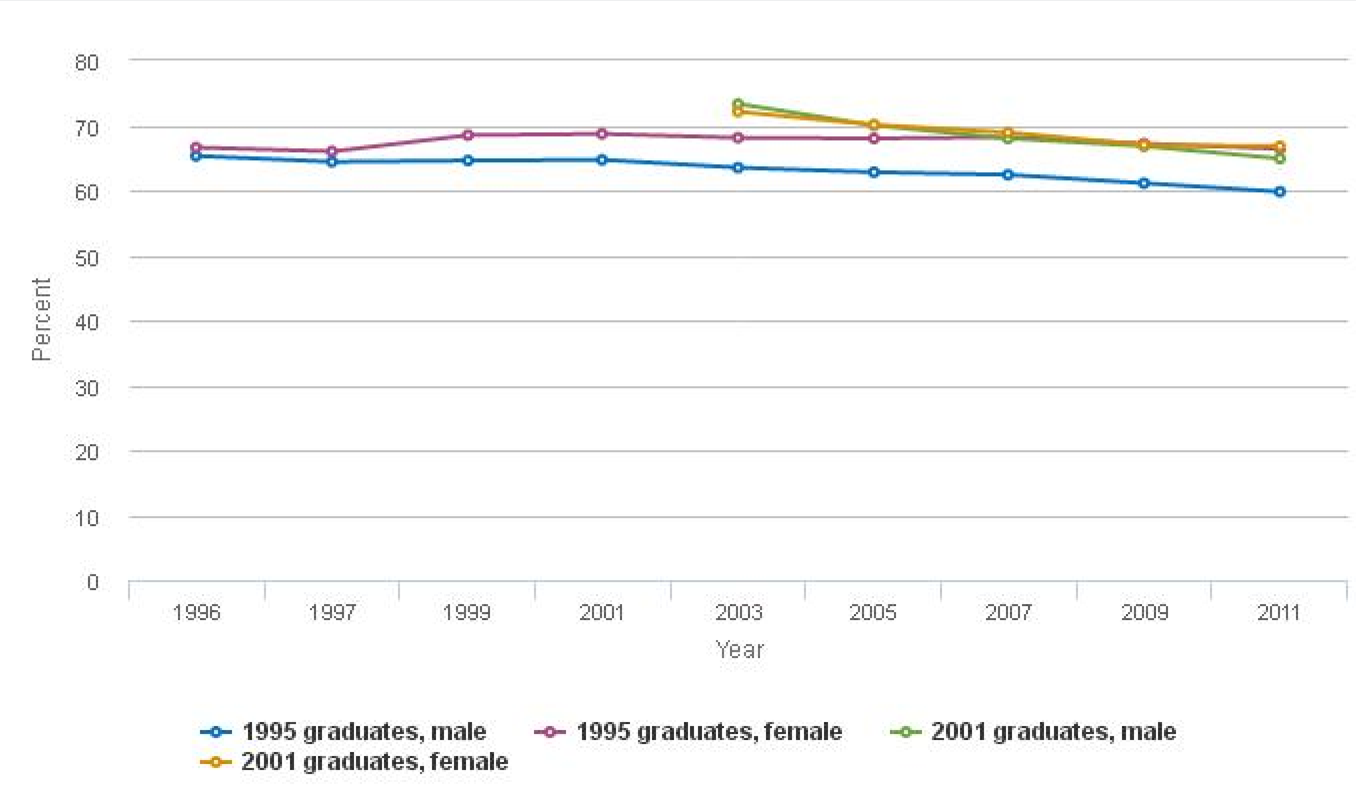
Long-Term Stay Rates for U.S. S&E Doctorate Recipients

Long-term stay rates indicate the degree to which foreign-born recipients of U.S. S&E doctorates enter and remain in the U.S. workforce to pursue their careers. For a particular cohort of foreign-born noncitizen S&E doctorate recipients, the proportion of that cohort who pay federal taxes a given number of years after receiving their degrees is an indicator of the cohort's long-term stay rate. Estimates of short-term stay rates are derived from data on reported intentions to stay in the United States within the year after graduation. The information on reported intentions to stay can be compared with stay rates based on tax data to analyze how stated intentions for the period immediately after graduation compare with actual behavior.

Stay rate data include foreign-born noncitizen recipients of U.S. S&E doctorates who were on either a permanent or a temporary visa at the time they received their doctorates. For the 1995 and the 2001 graduating cohorts, stay rate data are available separately for men and women. For the 1995 cohort, the stay rates for men declined with additional years since award of the doctorate whereas the stay rates for women did not show a similar pattern of decline (Figure 3-37). However, the data for the 2001 cohort show comparable changes in stay rates for both sexes. The men and women in this more recent cohort both start out with stay rates higher than the earlier cohort, but stay rates for women declined in similar fashion to those for men.

Figure 3-37

Stay rates for U.S. S&E doctoral degree recipients with permanent or temporary visas at graduation, by sex: 1996–2011



NA = not available.

NOTE: Data are not available for all categories for all years.

SOURCE: Finn, M. 2014. Stay Rates of Foreign Doctoral Recipients from U.S. Universities: 2011. Oak Ridge, TN: Oak Ridge Institute for Science and Education.

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Long-term stay rates vary greatly by country of citizenship, and the patterns are broadly similar to those observed in short-term stay rate data based on stated intentions. While Figure 3-37 shows the stay rate data annually for fixed cohorts (1995 and 2001 graduating cohorts), Table 3-27 presents data on 5-year stay rates in 2011. The 5-year stay rate data in 2011 reflect the stay rate of the cohort who received their doctorates 5 years earlier in 2006. Among doctorate recipients with temporary visas at graduation, those from China and India had stay rates that were significantly higher than average, and those from South Korea and other Asian countries and economies such as Taiwan, Japan, and Thailand had stay rates that were significantly lower than average (Table 3-27). In the Middle East, those from Iran had above-average stay rates, whereas those from Egypt and Turkey had below-average stay rates.

Table 3-27 **Five-year stay rates for U.S. S&E doctorate recipients with temporary visas at graduation, by selected country/economy: 2011**

(Percent)

Country/economy	5-year stay rate
All countries	66
China	85
Taiwan	38
Japan	38
South Korea	42
India	82
Thailand	19
Iran	92
Turkey	56
Egypt	48
Greece	47
Germany	53
Italy	57
France	62
Romania	83
Russia	73
Canada	55
Mexico	39
Brazil	37

Note: Data reflect the stay rate for the 2006 graduating cohort.

SOURCE: Finn, M. 2014. Stay Rates of Foreign Doctoral Recipients from U.S. Universities: 2011. Oak Ridge, TN: Oak Ridge Institute for Science and Education.

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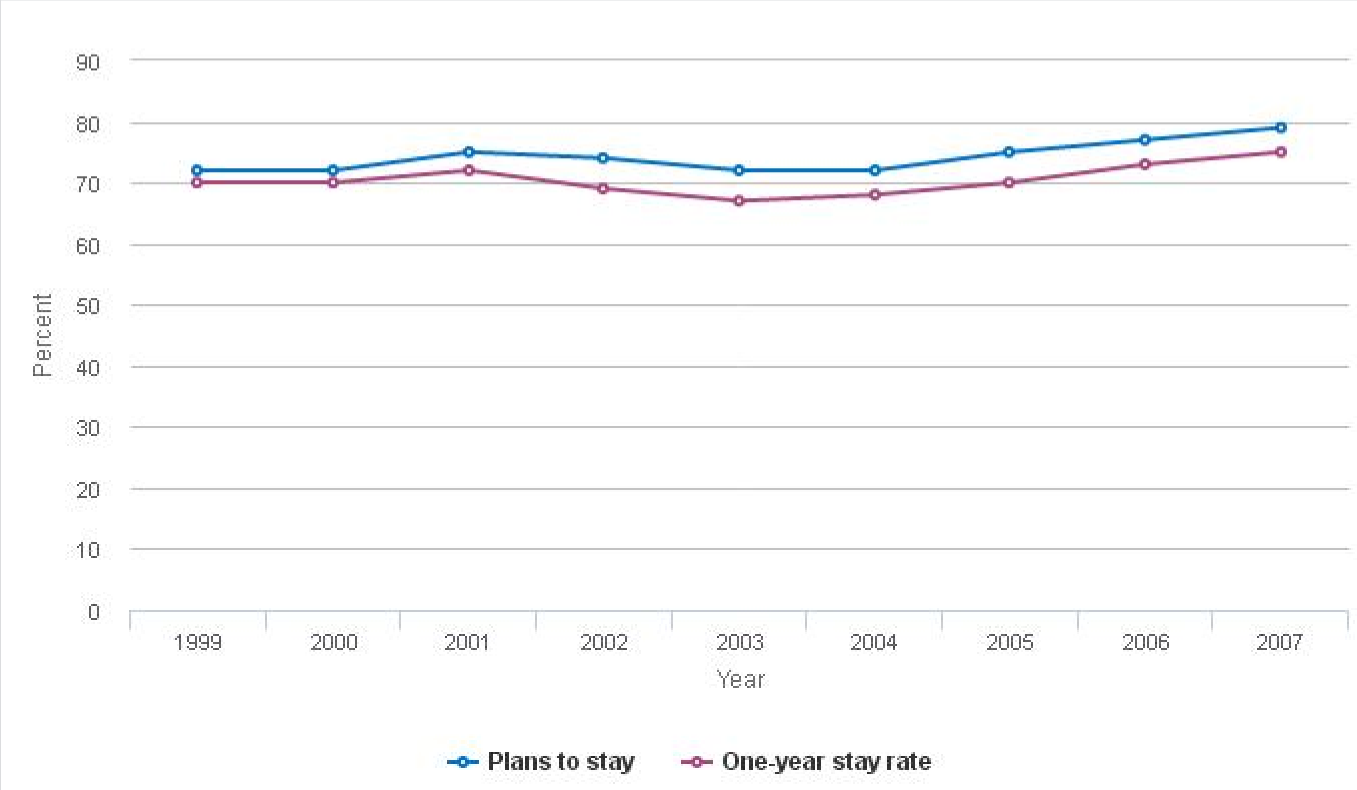
In recent years, the average 5-year stay rates have fluctuated within a fairly narrow range (between 64% and 67% from 2003 to 2011), neither increasing nor decreasing consistently (Finn 2014). From 2003 to 2011, stay rates among doctorate recipients with temporary visas from China and India, the two largest source countries, have gradually declined: from 93% to 85% for China and from 90% to 82% for India. Stay rates of those from South Korea, another large source country, have risen from 36% in 2003 to 42% in 2011.

Data from some older cohorts indicate that, among temporary visa holders receiving U.S. S&E doctorates, stated intentions to stay in the United States are reasonable indicators of actual behavior (Finn 2014). The data on stated intentions and long-term stay rates are estimated using very different data sources and methods. However, there has been a general congruence between the two. Figure 3-38 presents data on stated intentions and 1-year stay rates estimated with tax data for graduating classes of 1998 through 2006 (the data in Figure 3-38 for a given year reflect the intentions and stay rate of the graduating class from the previous year). For each graduating cohort, the proportion reporting plans to stay is slightly higher than the 1-year stay rate, which is not surprising given that some who stay do so for a period of less than 1 year, and some may change their plans. Overall, the data in Figure 3-38 suggest that the intentions data used to estimate short-term stay rates reasonably track actual stay rates, and the two series show remarkably similar patterns over time.

Figure 3-38

S&E doctorate recipients with temporary visas at graduation reporting plans to stay versus actual 1-year stay rate: 1999–2007



NOTE: Data for each year reflect the stated intentions and the stay rate for the cohort that received their doctoral degree in the previous year.

SOURCE: Finn, M. 2014. Stay Rates of Foreign Doctoral Recipients from U.S. Universities: 2011. Oak Ridge, TN: Oak Ridge Institute for Science and Education.

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Global S&E Labor Force

The rising emphasis on developing S&E expertise and technical capabilities has been a global phenomenon. S&E work is not limited to developed economies; it occurs throughout the world. However, much of the work is concentrated in developed nations, where a significant portion of R&D also takes place. The availability of a suitable labor force is an important determinant of where businesses choose to locate S&E work (Davis and Hart 2010). Concentrations of existing S&E work, in turn, spawn new employment opportunities for workers with relevant S&E knowledge and skills. As a result, governments in many countries have made increased investments in S&E-related postsecondary education a high priority. At the same time, high-skill workers, including those educated or employed in S&E fields, are increasingly mobile. In recent years, many nations, recognizing the value of high-skill workers for the economy as a whole, have changed their laws to make it easier for such workers to immigrate. These changes indicate an accelerating competition for globally mobile talent (Shachar 2006).

Data on the global S&E workforce are very limited, which makes it difficult to analyze the precise size and characteristics of this specialized workforce. Internationally comparable data are limited to establishment surveys that provide basic information about workers in S&E occupations or on workers with training in S&E disciplines. In contrast, SESTAT includes far more data on members of the U.S. S&E labor force than is available in other national statistical systems. In addition, although surveys that collect workforce data are conducted in many OECD member countries, they do not cover several countries—including Brazil and India—that have high and rising levels of science and technology capability, and they do not provide fully comparable data for China.

This section provides information about the size and growth of workforce segments whose jobs involve R&D in nations for which relevant data exist.

Size and Growth of the Global S&E Labor Force

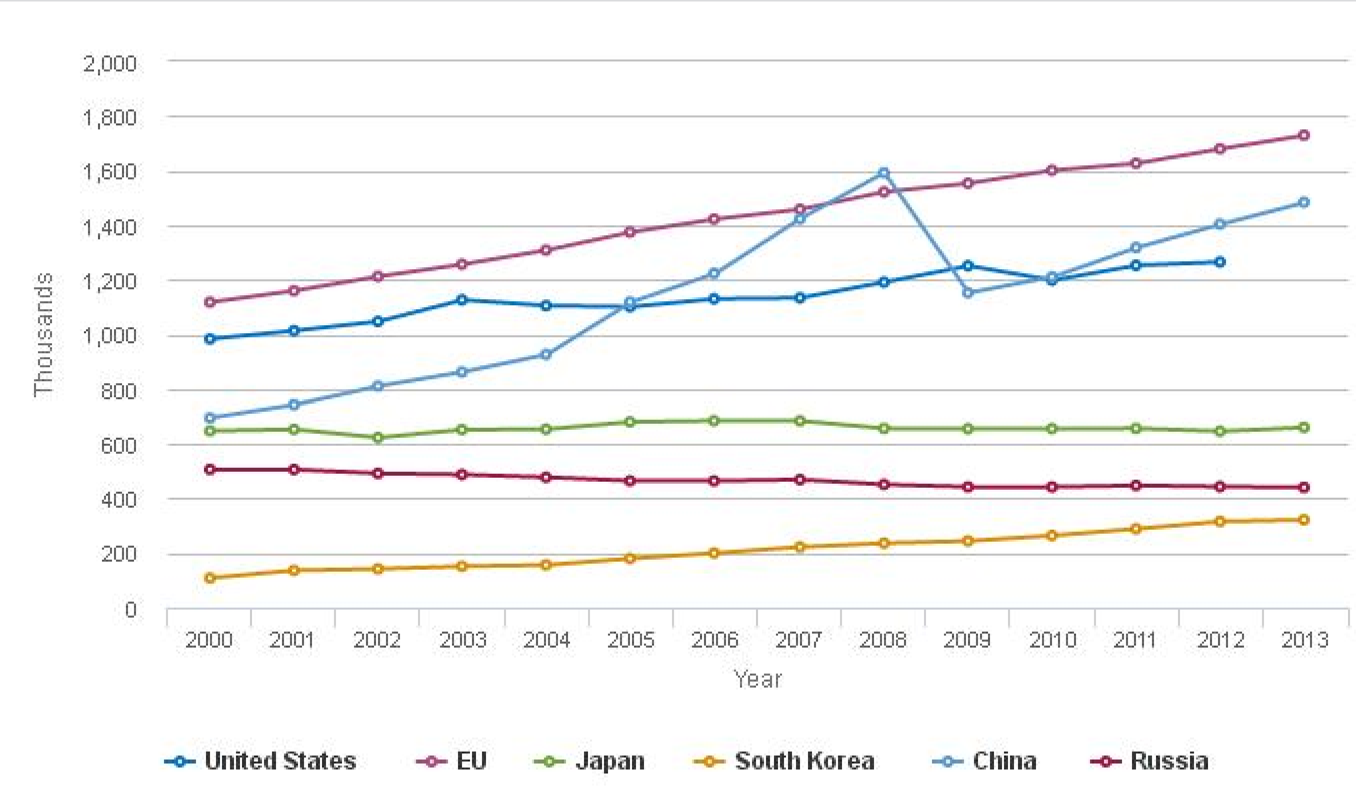
OECD data covering substantial, internationally comparable segments of the S&E workforce provide strong evidence of its widespread, though uneven, growth in the world's developed nations. OECD countries, which include most of the world's highly developed nations, compile data on researchers from establishment surveys in member and selected non-member countries. These surveys generally use a standardized occupational classification that defines researchers as "professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned" (OECD 2002:93). Because this definition can be applied differently when different nations conduct surveys, international comparisons should be made with caution. OECD also reports data on a broader measure of all personnel employed directly in R&D. In addition to researchers, the data on total R&D personnel include those who provide direct services to R&D such as clerical and administrative staff employed in R&D organizations.

OECD reports an estimated increase in the number of researchers in its member countries from 3.1 million in 2000 to 4.4 million in 2012. OECD also publishes estimates for seven nonmember economies, including China and Russia; adding these to the OECD member total for 2012 yields a worldwide estimate of 6.5 million researchers. However, numerous uncertainties affect this estimate, including, but not limited to, lack of coverage of countries with significant R&D enterprise as well as methodological inconsistencies over time and across countries. For example, some nonmember countries that engage in large and growing amounts of research (e.g., India, Brazil) are omitted entirely from these totals. In addition, for some countries and regions, including the United States and the European Union (EU; see "Glossary" for member countries), OECD estimates are derived from multiple national data sources and not from a uniform or standardized data collection procedure. For example, China's data from 2009 onwards are collected in accordance with OECD definitions and standards, whereas the data before 2009 are not consistent with OECD standards. South Korea’s data before 2007 excludes social sciences and humanities researchers and are therefore not consistent with the data from 2007 onwards.

Despite these limitations for making worldwide estimates of the number of researchers, the OECD data provide a reasonable starting point for estimating the rate of worldwide growth. For most economies with large numbers of researchers, growth since 2000 has been substantial (Figure 3-39). China, whose pre-2009 data did not entirely correspond to the OECD definition, reported more than twice the number of researchers in 2008 compared with 2000, and likewise reported substantial growth in later years. South Korea nearly doubled its number of researchers between 2000 and 2006 and continued to grow strongly between 2007 and 2012. The United States and the EU experienced steady growth but at a lower rate; the number of researchers grew 29% in the United States between 2000 and 2012 and 55% in the EU between 2000 and 2013. Exceptions to the overall worldwide trend included Japan (which experienced little change) and Russia (which experienced a decline; see also Gokhberg and Nekipelova 2002). Trends in full-time equivalent R&D personnel were generally parallel to those for researchers in those cases for which both kinds of data are available (Appendix Table 3-22).

Figure 3-39

Estimated number of researchers in selected regions/countries: 2000–13



NA = not available.

EU = European Union.

NOTES: Data are not available for all regions/countries for all years. Researchers are full-time equivalents. Counts for China before 2009 are not consistent with Organisation for Economic Co-operation and Development (OECD) standards. Counts for South Korea before 2007 exclude social sciences and humanities researchers.

SOURCE: OECD, *Main Science and Technology Indicators* (2015/1), http://www.oecd.org/sti/msti.htm.

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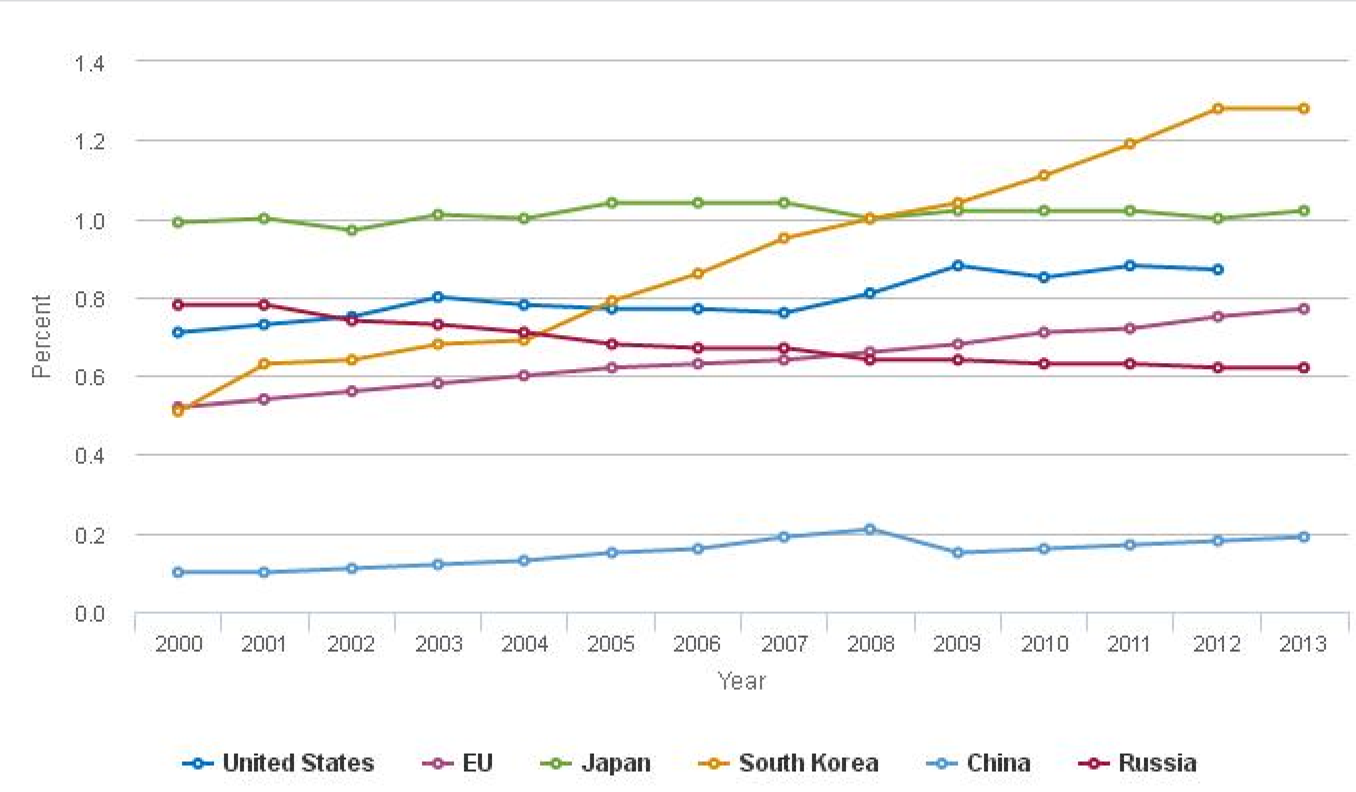
OECD also estimates the proportion of researchers in the workforce. In OECD's most recent estimates, small economies in Scandinavia (Denmark, Finland, Norway, Sweden) reported that between 1% and 2% of their employed workforce are researchers; small economies in East Asia (Singapore, Taiwan) reported that about 1% of their workforce are researchers (Appendix Table 3-23). Among economies with more than 200,000 researchers, OECD's latest estimates are that researchers make up the highest proportions of the workforce in South Korea (1.3%), Japan (1.0%), the United States (0.9%), and the United Kingdom (0.9%). Although China reported a large number of researchers, these workers represent a much smaller percentage of China's workforce (0.2%) than in OECD member countries. Additionally, China and South Korea have shown marked and continuous increases in the percentage of their workforce employed as researchers (Figure 3-40). Since 2000, this percentage remained mostly steady in Japan, rose slightly in the United States, and rose steadily in the EU.

Figure 3-40

Researchers as a share of total employment in selected regions/countries: 2000–13



NA = not available.

EU = European Union.

NOTES: Data are not available for all regions/countries for all years. Researchers are full-time equivalents. Counts for China before 2009 are not consistent with Organisation for Economic Co-operation and Development (OECD) standards. Counts for South Korea before 2007 exclude social sciences and humanities researchers.

SOURCE: OECD, *Main Science and Technology Indicators* (2015/1), http://www.oecd.org/sti/msti.htm.

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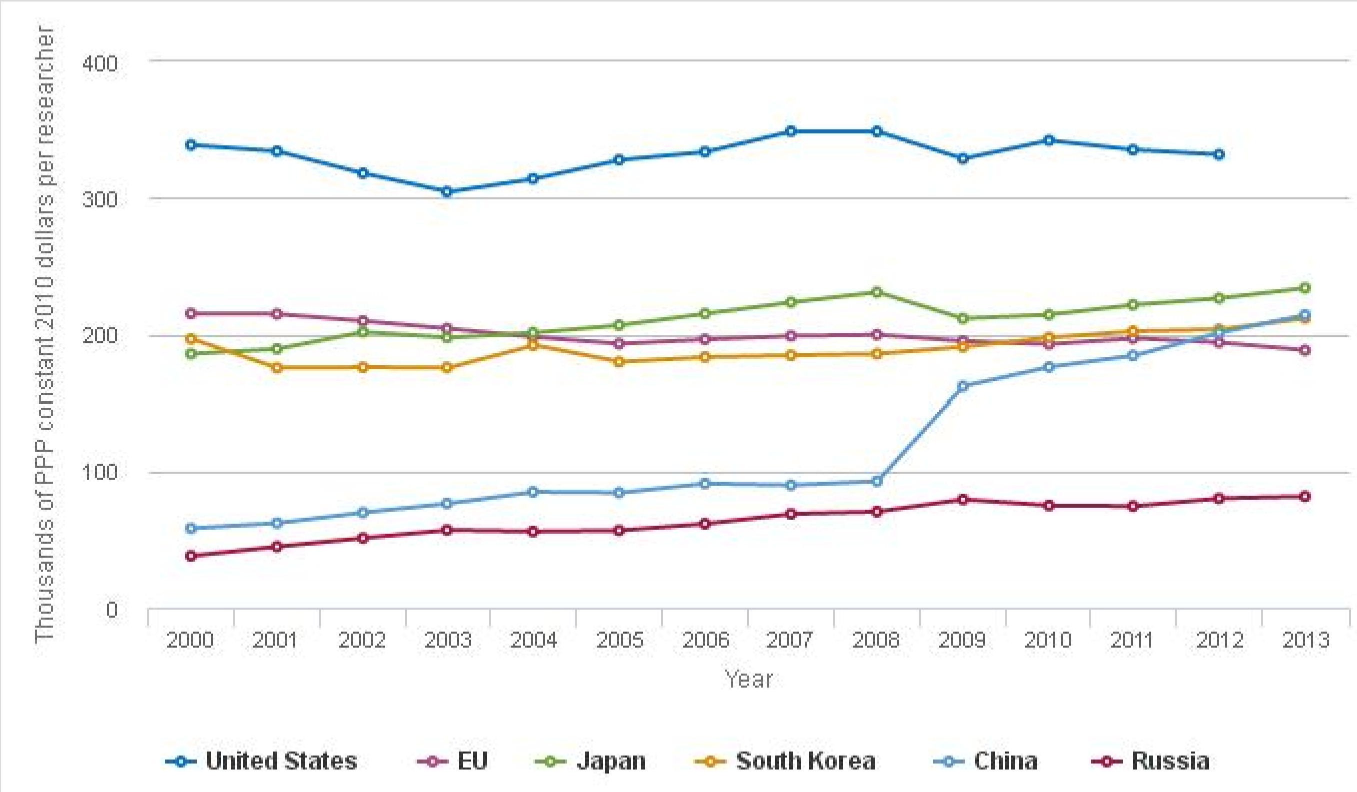
The proportion of female researchers varies considerably across OECD economies. According to the most recent estimates for the selected OECD countries for which data by sex are available, Japan (15% women) and South Korea (18% women) have a significant imbalance among researchers. By comparison, several European countries such as Belgium, Italy, Finland, Sweden, Spain, Norway, United Kingdom, Russia, and Poland, and several other countries such as Turkey and Singapore are more balanced with women representing between 30% and 40% of researchers. In France and Germany, about one-quarter of researchers are women.

OECD also provides data on gross domestic expenditures on R&D (GERD), which cover all R&D performed within the region/country/economy in a given year. The data on GERD may be combined with the data on researchers to get an estimate of R&D spending per researcher, which is another useful indicator of national resources devoted to advancing science and engineering. According to the most recent estimates, the United States, Germany, and Austria have the highest R&D expenditures per researcher (Appendix Table 3-23). Japan, South Korea, and China spend relatively similar amounts per researcher, although the number of researchers as a proportion of total employment is significantly lower in China than in Japan and South Korea. Other countries with large numbers of researchers, such as Canada, the United Kingdom, Spain, and Russia spend much less. Additionally, since 2000, GERD per researcher (in constant prices and purchasing power parity) has fluctuated within a relatively narrow range in the United States, the EU, and South Korea (Figure 3-41). China, whose pre-2009 data did not entirely correspond to the OECD definition, reported nearly 60% more GERD per researcher in 2008 compared with 2000, and this number continued to grow between 2009 and 2013.

Figure 3-41

Gross domestic R&D expenditures (GERD) per researcher in selected regions/countries: 2000–13



NA = not available.

EU = European Union; PPP = purchasing power parity.

NOTES: Data are not available for all regions/countries for all years. Researchers are full-time equivalents. The data for China before 2009 are not consistent with Organisation for Economic Co-operation and Development (OECD) standards. The data for South Korea before 2007 exclude social sciences and humanities R&D.

SOURCE: OECD, *Main Science and Technology Indicators* (2015/1), http://www.oecd.org/sti/msti.htm.

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Conclusion

The S&E workforce may be defined in a variety of ways. At its core are individuals in S&E occupations, but those with S&E degrees who are employed in a variety of other jobs make important contributions to the nation's welfare. Many more individuals hold S&E degrees than work in S&E occupations. Indicative of a knowledge-based economy, many of those in non-S&E occupations report that their work nonetheless requires at least a bachelor's degree level of S&E knowledge and skills. This suggests that the application of S&E knowledge and technical expertise is widespread across the U.S. economy and not limited to S&E occupations.

In both the United States and the rest of the world, the S&E workforce has experienced strong growth. During the 2007–09 recession, U.S. S&E employment remained more resilient than overall employment. Policymakers with otherwise divergent perspectives agree that jobs involving S&E are good for workers and good for the economy as a whole. These jobs pay more, even when compared to non-S&E jobs requiring similar levels of education and comparably specialized skills. Although S&E workers are not totally shielded from joblessness, workers with S&E training or in S&E occupations are less often exposed to periods of unemployment.

Innovation based on S&E R&D is globally recognized as an important vehicle for a nation's economic growth and competitive advantage, and growing numbers of workers worldwide are engaged in research. Growth has been especially marked in rapidly developing economies, such as China and South Korea, that have either recently joined the ranks of the world's developed economies or are poised to do so. Mature developed economies in North America and Europe have maintained slower growth, but the number of researchers in the struggling Japanese economy has somewhat stagnated.

The demographic composition of the S&E workforce in the United States is changing. The baby boom portion of the S&E workforce continues to age into retirement. However, increasing proportions of scientists and engineers are postponing retirement to somewhat later ages. At the same time, members of historically underrepresented groups—women and, to a lesser degree, blacks and Hispanics—have played an increasing role in the S&E labor force; although this has been more the case in some fields (e.g., life sciences and social sciences) than in others (e.g., computer and mathematical sciences, physical sciences, and engineering). Despite the recent increases in S&E participation by women and by racial and ethnic minorities, both groups remain underrepresented in S&E compared to their overall labor force participation. For example, women account for less than one-third of all workers employed in S&E occupations in the United States despite representing half of the college-educated workforce.

The United States has remained an attractive destination for foreign students and workers with advanced S&E training. In the wake of the 2001 recession, there were increases in both temporary work visas and stay rates of foreign recipients of S&E doctorates. Although declines occurred during the 2007–09 economic downturn—a period marked by rising unemployment in the United States among workers in S&E as well as in other occupations—data since the downturn suggest that the decline may have been temporary.

In today's dynamic marketplace, where information flows rapidly and technology is always evolving, labor market conditions change fast. Numerous factors—such as global competition, demographic trends, aggregate economic activities, and S&E training pathways and career opportunities—will affect the availability of workers equipped with S&E expertise as well as the kinds of jobs that the U.S. economy generates in the future. As a result, comprehensive and timely analysis of current labor force and demographic trends will play a critical role in providing the information needed to understand the dynamic S&E landscape both in the United States and globally.

Glossary

European Union (EU): As of September 2015, the EU comprised 28 member nations: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom. Unless otherwise noted, Organisation for Economic Co-operation and Development data on the EU include all of these 28 members.

Involuntarily out of field (IOF) employment: Employment in a job not related to the field of one's highest degree because a job in that field was not available. The IOF rate is the proportion of all employed individuals who report IOF employment.

Labor force: A subset of the population that includes both those who are employed and those who are not working but seeking work (unemployed); other individuals are not considered to be in the labor force.

Organisation for Economic Co-operation and Development (OECD): An international organization of 34 countries headquartered in Paris, France. The member countries are Australia, Austria, Belgium, Canada, Chile, Czech Republic, Estonia, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, South Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States. Among its many activities, the OECD compiles social, economic, and science and technology statistics for all member and selected nonmember countries.

Postdoc: A temporary position awarded in academia, industry, government, or a nonprofit organization, primarily for gaining additional education and training in research after completion of a doctorate.

Scientists and Engineers Statistical Data System (SESTAT): A system of surveys conducted by the National Science Foundation that measure the educational, occupational, and demographic characteristics of the S&E workforce. The surveys are the National Survey of College Graduates (NSCG) and the Survey of Doctorate Recipients (SDR).

Stay rate: The proportion of foreign recipients of U.S. S&E doctoral degrees who stay in the United States after receiving their doctorate.

Workforce: A subset of the labor force that includes only employed individuals.

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