Science and Engineering Labor Force

Technical Appendix

NSB-2019-8
September 26, 2019

This publication is part of the Science and Engineering Indicators suite of reports. Indicators is a congressionally mandated report on the state of the U.S. science and engineering enterprise. It is policy relevant and policy neutral. Indicators is prepared under the guidance of the National Science Board by the National Center for Science and Engineering Statistics, a federal statistical agency within the National Science Foundation. With the 2020 edition, Indicators is changing from a single report to a set of disaggregated and streamlined reports published on a rolling basis. Detailed data tables will continue to be available online.
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Technical Appendix

Data Used in the Science and Engineering Labor Force Report

The Science and Engineering Labor Force report uses a variety of data sources, including, but not limited to, the National Center for Science and Engineering Statistics (NCSES) Scientists and Engineers Statistical Data System (SESTAT), National Survey of College Graduates (NSCG), Survey of Doctorate Recipients (SDR), Survey of Earned Doctorates (SED), and Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS); the U.S Census Bureau’s American Community Survey (ACS); the Occupational Employment Statistics (OES) survey administered by the Bureau of Labor Statistics (BLS); the Current Population Survey (CPS) sponsored jointly by the Census Bureau and BLS; and the U.S. Department of State Nonimmigrant Visa Statistics. Different sources cover different segments of the population and different levels of detail on the various topics (Table SA3-1). Although data collection methods and definitions can differ across surveys in ways that affect estimates, presenting data from different sources facilitates a more accurate and comprehensive picture of the very specialized S&E workforce. Long-term trends, international trends, and comparisons of S&E and non-S&E workers are discussed in the report when the suitable data are available.

### TABLE SA3-1

<table>
<thead>
<tr>
<th>Major sources of data on the U.S. labor force</th>
<th>Data collection/sponsor agency</th>
<th>Data years</th>
<th>Information used in report</th>
<th>Respondent</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational Employment Statistics (OES), <a href="https://www.bls.gov/oes/">https://www.bls.gov/oes/</a></td>
<td>Department of Labor, Bureau of Labor Statistics</td>
<td>Through 2017</td>
<td>Worker occupation, salary, industry, employer location (national, state, metropolitan statistical area)</td>
<td>Employing organizations</td>
<td>All full-time and part-time wage and salary workers in nonfarm industries; does not cover self-employed, owners and partners in unincorporated firms, household workers, or unpaid family workers</td>
</tr>
<tr>
<td>National Survey of College Graduates (NSCG), <a href="https://www.nsf.gov/statistics/srvygrads/">https://www.nsf.gov/statistics/srvygrads/</a></td>
<td>Department of Commerce, Census Bureau; National Center for Science and Engineering Statistics, National Science Foundation</td>
<td>Through 2017</td>
<td>Employment status, occupation, job characteristics (work activities, technical expertise), salary, detailed educational history, demographic characteristics</td>
<td>Individuals</td>
<td>Individuals with a bachelor’s degree or higher in any field, including an oversample of individuals with a bachelor’s degree or higher in an S&amp;E or S&amp;E-related field or with non-S&amp;E degrees but working in an S&amp;E or S&amp;E-related occupation</td>
</tr>
<tr>
<td>Survey of Doctorate Recipients (SDR), <a href="https://www.nsf.gov/statistics/srvydoctoratework/">https://www.nsf.gov/statistics/srvydoctoratework/</a></td>
<td>National Center for Science and Engineering Statistics, National Science Foundation</td>
<td>Through 2017</td>
<td>Employment status, occupation, job characteristics (work activities, technical expertise), salary, detailed educational history, demographic characteristics</td>
<td>Individuals</td>
<td>Individuals with U.S.-awarded research doctorates (includes both U.S. and non-U.S. residents)</td>
</tr>
<tr>
<td>American Community Survey (ACS), <a href="https://www.census.gov/programs-surveys/acs/">https://www.census.gov/programs-surveys/acs/</a></td>
<td>Department of Commerce, Census Bureau</td>
<td>Through 2017</td>
<td>Employment status, occupation, educational attainment, demographic characteristics</td>
<td>Households</td>
<td>U.S. population</td>
</tr>
</tbody>
</table>
The data from NCSES within National Science Foundation (NSF) provide detailed employment, education, and demographic information for adult scientists and engineers under age 76 residing in the United States. Scientists and engineers are defined as individuals who have a bachelor’s level or higher degree in science and engineering (S&E) or S&E-related fields or who have a non-S&E degree at the bachelor’s level or higher and are working in S&E or S&E-related occupations. Unless otherwise noted, the report uses the term scientists and engineers to refer to this broad definition and the term college graduates to refer to the population with at least a bachelor’s degree. The data available on scientists and engineers are collected by two large demographic and workforce surveys of individuals conducted by NCSES: the NSCG and SDR.

The NSCG and SDR provide the most comprehensive information about the size and characteristics of the S&E labor force. Because the NSCG covers the entire population of college graduates residing in the United States, this survey provides information on individuals educated or employed in S&E fields as well as those educated or employed in non-S&E fields. Whereas NSCG data cover the general college-educated population, the SDR data provide information on 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 biennial survey that has been conducted since 1973; it is a unique source of information on educational and occupational achievements and career movements of the nation’s doctoral scientists and engineers. More information on the NSCG and SDR are available at https://www.nsf.gov/statistics/srvygrads/ and https://www.nsf.gov/statistics/srvydoctoratework/.

Census Bureau Occupational Data

The S&E Labor Force Report uses data from the Census Bureau to analyze the growth in the S&E workforce since 1960 and long-term unemployment trends. The types of occupations categorized as S&E have changed over time since 1960 as the economy has become more knowledge based and technological, and new occupations have been created as a result. See Table SA3-2 for a list of the occupations included in each year analyzed in the report.

Similarly, occupation codes have changed when defining S&E workers for the purposes of analyzing long-term employment trends. Table SA3-3 and Table SA3-4 shows the names and codes of the occupations included in each year analyzed in the report.

TABLE SA3-2

<table>
<thead>
<tr>
<th>S&amp;E occupations in the U.S. Census and American Community Survey: Various years</th>
</tr>
</thead>
<tbody>
<tr>
<td>(List of S&amp;E occupations)</td>
</tr>
<tr>
<td>Biological, agricultural, and environmental life scientists</td>
</tr>
<tr>
<td>Agricultural scientists</td>
</tr>
<tr>
<td>Biological scientists</td>
</tr>
<tr>
<td>Foresters and conservationists</td>
</tr>
<tr>
<td>Marine scientists</td>
</tr>
<tr>
<td>Medical scientists</td>
</tr>
<tr>
<td>Mathematical scientists</td>
</tr>
<tr>
<td>Mathematicians</td>
</tr>
<tr>
<td>Statisticians and actuaries</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Computer systems analysts</td>
</tr>
<tr>
<td>Database administrators</td>
</tr>
<tr>
<td>Network systems and data communication analysts</td>
</tr>
<tr>
<td>Operations and systems researchers and analysts</td>
</tr>
<tr>
<td>Operations research analysts</td>
</tr>
<tr>
<td>Software developers, applications and systems software</td>
</tr>
<tr>
<td>Computer specialists nec</td>
</tr>
<tr>
<td>Mathematicians</td>
</tr>
<tr>
<td>Statisticians</td>
</tr>
<tr>
<td>Mathematical scientists nec</td>
</tr>
<tr>
<td>Physical scientists</td>
</tr>
<tr>
<td>Geologists and geophysicists</td>
</tr>
<tr>
<td>Physicists</td>
</tr>
<tr>
<td>Miscellaneous natural scientists</td>
</tr>
<tr>
<td>Life and physical scientists nec</td>
</tr>
<tr>
<td>Social scientists</td>
</tr>
<tr>
<td>Psychologists</td>
</tr>
<tr>
<td>Sociologists</td>
</tr>
<tr>
<td>Political scientists</td>
</tr>
<tr>
<td>Urban and regional planners</td>
</tr>
<tr>
<td>Miscellaneous social scientists</td>
</tr>
<tr>
<td>Engineers</td>
</tr>
<tr>
<td>Aeronautical engineers</td>
</tr>
<tr>
<td>Chemical engineers</td>
</tr>
<tr>
<td>Civil engineers</td>
</tr>
<tr>
<td>Electrical engineers</td>
</tr>
<tr>
<td>Industrial engineers</td>
</tr>
<tr>
<td>Mechanical engineers</td>
</tr>
</tbody>
</table>
### TABLE SA3-2

S&E occupations in the U.S. Census and American Community Survey: Various years

(List of S&E occupations)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Metallurgical engineers and metallurgists</td>
<td>Metallurgical and materials engineers</td>
<td>Electrical and electronic</td>
<td>Electrical and electronics engineers</td>
<td>Electrical engineers</td>
</tr>
<tr>
<td>Mining engineers</td>
<td>Mining engineers</td>
<td>Industrial</td>
<td>Environmental engineers</td>
<td>Environmental engineers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Industrial engineers, including health and safety</td>
<td>Industrial engineers, including health and safety engineers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Marine and naval architects</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Marine engineers</td>
<td>Marine engineers and naval architects</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metallurgical and materials</td>
<td>Materials engineers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mechanical</td>
<td>Mechanical engineers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mining</td>
<td>Mining and geological engineers, including mining safety engineers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nuclear</td>
<td>Nuclear engineers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Petroleum engineers</td>
<td>Petroleum engineers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sales engineers</td>
<td>Sales engineers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Engineers nec</td>
<td>Miscellaneous engineers, including agricultural and biomedical</td>
</tr>
</tbody>
</table>

nec = not elsewhere classified.

Source(s)

Census Bureau, Decennial Census, and the American Community Survey (ACS) Public Use Microdata Sample (PUMS).

Science and Engineering Indicators

### TABLE SA3-3

S&E occupations in the Current Population Survey: Various years

(List of S&E occupations)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer systems analysts and scientists</td>
<td>Computer scientists and systems analysts</td>
<td>Logisticians</td>
</tr>
<tr>
<td>Computer software engineers</td>
<td>Software developers, applications and systems software</td>
<td>Computer and information research scientists</td>
</tr>
<tr>
<td>Computer support specialists</td>
<td>Web developers</td>
<td>Computer systems analysts</td>
</tr>
<tr>
<td>Database administrators</td>
<td>Information security analysts</td>
<td></td>
</tr>
<tr>
<td>Network and computer systems administrators</td>
<td></td>
<td>Software developers, applications and systems software</td>
</tr>
</tbody>
</table>

Source(s)

Census Bureau, Decennial Census, and the American Community Survey (ACS) Public Use Microdata Sample (PUMS).
# TABLE SA3-3

## S&E occupations in the Current Population Survey: Various years

(List of S&E occupations)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Network systems and data communications analysts</strong></td>
<td>Computer network architects</td>
<td></td>
</tr>
<tr>
<td><strong>Mathematicians</strong></td>
<td>Mathematicians</td>
<td>Mathematicians</td>
</tr>
<tr>
<td><strong>Operations and systems researchers and analysts</strong></td>
<td>Operations research analysts</td>
<td>Operations research analysts</td>
</tr>
<tr>
<td><strong>Statisticians</strong></td>
<td>Statisticians</td>
<td>Statisticians</td>
</tr>
<tr>
<td><strong>Mathematical scientists nec</strong></td>
<td>Miscellaneous mathematical science occupations</td>
<td>Miscellaneous mathematical science occupations, including mathematicians and statisticians</td>
</tr>
<tr>
<td><strong>Aerospace</strong></td>
<td>Aerospace engineers</td>
<td>Aerospace engineers</td>
</tr>
<tr>
<td><strong>Agricultural</strong></td>
<td>Agricultural engineers</td>
<td>Agricultural engineers</td>
</tr>
<tr>
<td><strong>Biomedical engineers</strong></td>
<td>Biomedical and agricultural engineers</td>
<td></td>
</tr>
<tr>
<td><strong>Chemical</strong></td>
<td>Chemical engineers</td>
<td>Chemical engineers</td>
</tr>
<tr>
<td><strong>Civil</strong></td>
<td>Civil engineers</td>
<td>Civil engineers</td>
</tr>
<tr>
<td><strong>Electrical and electronic</strong></td>
<td>Electrical and electronic engineers</td>
<td>Electrical and electronics engineers</td>
</tr>
<tr>
<td><strong>Industrial</strong></td>
<td>Environmental engineers</td>
<td>Environmental engineers</td>
</tr>
<tr>
<td><strong>Marine and naval architects</strong></td>
<td>Marine engineers and naval architects</td>
<td>Marine engineers and naval architects</td>
</tr>
<tr>
<td><strong>Metallurgical and materials</strong></td>
<td>Materials engineers</td>
<td>Materials engineers</td>
</tr>
<tr>
<td><strong>Mechanical</strong></td>
<td>Mechanical engineers</td>
<td>Mechanical engineers</td>
</tr>
<tr>
<td><strong>Mining</strong></td>
<td>Mining and geological engineers, including mining safety engineers</td>
<td>Mining and geological engineers, including mining safety engineers</td>
</tr>
<tr>
<td><strong>Nuclear</strong></td>
<td>Nuclear engineers</td>
<td>Nuclear engineers</td>
</tr>
<tr>
<td><strong>Petroleum</strong></td>
<td>Petroleum engineers</td>
<td>Petroleum, mining and geological engineers, including mining safety engineers</td>
</tr>
<tr>
<td><strong>Engineers nec</strong></td>
<td>Engineers, all other</td>
<td>Miscellaneous engineers, including nuclear engineers</td>
</tr>
<tr>
<td><strong>Agricultural and food scientists</strong></td>
<td>Agricultural and food scientists</td>
<td>Agricultural and food scientists</td>
</tr>
<tr>
<td><strong>Biological and life scientists</strong></td>
<td>Biological scientists</td>
<td>Biological scientists</td>
</tr>
<tr>
<td><strong>Forestry and conservation scientists</strong></td>
<td>Conservation scientists and foresters</td>
<td>Conservation scientists and foresters</td>
</tr>
<tr>
<td><strong>Medical scientists</strong></td>
<td>Medical scientists</td>
<td>Medical scientists, and life scientists, all other</td>
</tr>
<tr>
<td><strong>Physicists and astronomers</strong></td>
<td>Astronomers and physicists</td>
<td>Astronomers and physicists</td>
</tr>
<tr>
<td><strong>Atmospheric and space scientists</strong></td>
<td>Atmospheric and space scientists</td>
<td>Atmospheric and space scientists</td>
</tr>
<tr>
<td><strong>Chemists, except biochemists</strong></td>
<td>Chemists and materials scientists</td>
<td>Chemists and materials scientists</td>
</tr>
<tr>
<td><strong>Geologists and geodesists</strong></td>
<td>Environmental scientists and geoscientists</td>
<td>Environmental scientists and geoscientists</td>
</tr>
<tr>
<td><strong>Physical scientists nec</strong></td>
<td>Physical scientists, all other</td>
<td>Physical scientists, all other</td>
</tr>
<tr>
<td><strong>Economists</strong></td>
<td>Economists</td>
<td>Economists</td>
</tr>
<tr>
<td><strong>Psychologists</strong></td>
<td>Psychologists</td>
<td>Psychologists</td>
</tr>
<tr>
<td><strong>Sociologists</strong></td>
<td>Sociologists</td>
<td>Sociologists</td>
</tr>
<tr>
<td><strong>Urban and regional planners</strong></td>
<td>Urban and regional planners</td>
<td>Urban and regional planners</td>
</tr>
<tr>
<td><strong>Social scientists nec</strong></td>
<td>Miscellaneous social scientists and related workers</td>
<td>Miscellaneous social scientists, including survey researchers and sociologists</td>
</tr>
<tr>
<td><strong>Sales engineers</strong></td>
<td>Sales engineers</td>
<td>Sales engineers</td>
</tr>
<tr>
<td><strong>Ship engineers</strong></td>
<td>Ship engineers</td>
<td>Ship engineers</td>
</tr>
</tbody>
</table>

**Source(s)**
TABLE SA3-4

S&E technicians and computer programmers occupations in the Current Population Survey: Various years
(List of S&E technician and computer programmer occupations)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical and electronic technicians</td>
<td>Engineering technicians, except drafters</td>
<td>Engineering technicians, except drafters</td>
<td>Geological and petroleum technicians, and nuclear technicians</td>
</tr>
<tr>
<td>Industrial engineering technicians</td>
<td>Engineering technicians, except drafters</td>
<td>Geological and petroleum technicians</td>
<td>Biological technicians</td>
</tr>
<tr>
<td>Mechanical engineering technicians</td>
<td>Engineering technicians, except drafters</td>
<td>Geological and petroleum technicians</td>
<td>Biological technicians</td>
</tr>
<tr>
<td>Engineering technicians nec</td>
<td>Geological and petroleum technicians</td>
<td>Geological and petroleum technicians, and nuclear technicians</td>
<td>Biological technicians</td>
</tr>
<tr>
<td>Biological technicians</td>
<td>Biological technicians</td>
<td>Biological technicians</td>
<td>Chemical technicians</td>
</tr>
<tr>
<td>Chemical technicians</td>
<td>Chemical technicians</td>
<td>Chemical technicians</td>
<td>Science technicians nec</td>
</tr>
<tr>
<td>Science technicians nec</td>
<td>Other life, physical, and social science technicians</td>
<td>Other life, physical, and social science technicians</td>
<td>Computer programmers</td>
</tr>
<tr>
<td>Computer programmers</td>
<td>Computer programmers</td>
<td>Computer programmers</td>
<td>Computer programmers</td>
</tr>
</tbody>
</table>

Source(s)

The Skilled Technical Workforce Data

We define the skilled technical workforce using a combination of occupation designations from NCSES and from work conducted on behalf of the National Academies Board on Science, Technology, and Economic Policy ("the Academies") for individuals whose educational attainment levels are less than a bachelor’s degree. Jonathan Rothwell’s 2015 publication “Defining Skilled Technical Work”—prepared for the Academies’ project on “The Supply Chain for Middle-Skilled Jobs: Education, Training, and Certification Pathways,” provides an approach to designating occupations that require significant scientific and technological expertise, but not necessarily a bachelor’s level degree or higher. This section will briefly explain the approach used for the Academies’ work and the NCSES occupations included in the definition used for the “Science and Engineering Labor Force” thematic report prepared for Indicators 2020.

Following the methodology of the Rothwell publication, this work uses skills-based data to identify occupations that rely upon workers with relatively high levels of scientific and technological skills and expertise. The U.S. Department of Labor sponsors data collected as part of the O*NET program. The O*NET program has created a content model capturing the distinguishing characteristics of an occupation and standardizing them into a measurable set of variables. Rothwell’s analysis, as outlined in the paper, utilizes the O*NET knowledge survey, which asks workers to rate the level of knowledge needed to perform their job across 33 distinct knowledge domains on a 1 to 7 scale. Using the O*NET version 19.0 and 2014 OES data, this report defines the occupations of the skilled technical workforce (STW) at the Standard Occupation Codes (SOC) level. The Rothwell criteria for inclusion of an occupation in the STW was a knowledge score in technical fields of at least 4.50 and a minority of individuals in that occupation with an educational attainment of a bachelor’s degree or higher.
Using the occupation designations from the Rothwell approach in combination with occupations designated by NCSES as S&E or S&E-related occupations, the report uses ACS public use microdata (PUMS) to measure the size of this workforce. A crosswalk was produced between the SOC codes to the ACS occupation codes to enable aggregation up to the ACS occupation codes. This crosswalk is based on a crosswalk between SOC and occupation codes provided by the Census Bureau. SOC codes that did not have entries in the O*NET database were manually mapped to a similar field using the shared 5-digit codes. This resulted in multiple SOC codes being mapped to a single occupation code, so the OES employment data were used to create employment-weighted fractions of the O*NET scores for each SOC code. Table SA3-5 provides a list of the STW occupations and the employment of the STW in each occupation.

### Table SA3-5

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>All occupations</td>
<td>17,002,829</td>
</tr>
<tr>
<td>Architecture and engineering occupations</td>
<td>820,722</td>
</tr>
<tr>
<td>Aerospace engineers</td>
<td>14,817</td>
</tr>
<tr>
<td>Architects, except naval</td>
<td>16,343</td>
</tr>
<tr>
<td>Biomedical engineers</td>
<td>2,251</td>
</tr>
<tr>
<td>Chemical engineers</td>
<td>4,590</td>
</tr>
<tr>
<td>Civil engineers</td>
<td>40,535</td>
</tr>
<tr>
<td>Computer hardware engineers</td>
<td>10,147</td>
</tr>
<tr>
<td>Drafters</td>
<td>111,986</td>
</tr>
<tr>
<td>Electrical and electronics engineers</td>
<td>44,860</td>
</tr>
<tr>
<td>Engineering technicians, except drafters</td>
<td>282,729</td>
</tr>
<tr>
<td>Engineers, all other</td>
<td>98,116</td>
</tr>
<tr>
<td>Environmental engineers</td>
<td>3,179</td>
</tr>
<tr>
<td>Industrial engineers, including health and safety</td>
<td>58,093</td>
</tr>
<tr>
<td>Marine engineers and naval architects</td>
<td>3,385</td>
</tr>
<tr>
<td>Materials engineers</td>
<td>9,022</td>
</tr>
<tr>
<td>Mechanical engineers</td>
<td>57,159</td>
</tr>
<tr>
<td>Petroleum engineers</td>
<td>6,223</td>
</tr>
<tr>
<td>Surveying and mapping technicians</td>
<td>50,951</td>
</tr>
<tr>
<td>Surveyors, cartographers, and photogrammetrists</td>
<td>6,336</td>
</tr>
<tr>
<td>Arts, design, entertainment, sports, and media occupations</td>
<td>172,073</td>
</tr>
<tr>
<td>Broadcast and sound engineering technicians and radio operators</td>
<td>60,549</td>
</tr>
<tr>
<td>Photographers</td>
<td>75,542</td>
</tr>
<tr>
<td>Technical writers</td>
<td>14,358</td>
</tr>
<tr>
<td>Television, video, and motion picture camera operators and editors</td>
<td>21,624</td>
</tr>
<tr>
<td>Business and financial operations occupations</td>
<td>251,418</td>
</tr>
<tr>
<td>Appraisers and assessors of real estate</td>
<td>35,683</td>
</tr>
<tr>
<td>Logisticians</td>
<td>75,039</td>
</tr>
<tr>
<td>Tax examiners and collectors, and revenue agents</td>
<td>25,111</td>
</tr>
<tr>
<td>Wholesale and retail buyers, except farm products</td>
<td>115,585</td>
</tr>
<tr>
<td>Computer and mathematical occupations</td>
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<td>Actuaries</td>
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<tr>
<td>Computer and information research scientists</td>
<td>614</td>
</tr>
<tr>
<td>Computer network architects</td>
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<tr>
<td>Computer occupations, all other</td>
<td>292,350</td>
</tr>
<tr>
<td>Computer programmers</td>
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<td>Computer support specialists</td>
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<tr>
<td>Computer systems analysts</td>
<td>131,080</td>
</tr>
<tr>
<td>Database administrators</td>
<td>30,626</td>
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<tr>
<td>Information security analysts</td>
<td>29,472</td>
</tr>
<tr>
<td>Occupation</td>
<td>Employment</td>
</tr>
<tr>
<td>------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Miscellaneous mathematical science occupations</td>
<td>4,939</td>
</tr>
<tr>
<td>Network and computer systems administrators</td>
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<tr>
<td>Operations research analysts</td>
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<tr>
<td>Software developers, applications and systems software</td>
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</tr>
<tr>
<td>Web developers</td>
<td>55,010</td>
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<tr>
<td>Construction and extraction occupations</td>
<td>3,552,569</td>
</tr>
<tr>
<td>Boilermakers</td>
<td>13,629</td>
</tr>
<tr>
<td>Brickmasons, blockmasons, and stonemasons</td>
<td>133,466</td>
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<tr>
<td>Carpenters</td>
<td>1,073,301</td>
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<tr>
<td>Construction and building inspectors</td>
<td>64,108</td>
</tr>
<tr>
<td>Derrick, rotary drill, and service unit operators, oil, gas, and mining</td>
<td>23,853</td>
</tr>
<tr>
<td>Drywall installers, ceiling tile installers, and tapers</td>
<td>128,315</td>
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<tr>
<td>Earth drillers, except oil and gas</td>
<td>20,783</td>
</tr>
<tr>
<td>Electricians</td>
<td>704,915</td>
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<tr>
<td>Elevator installers and repairers</td>
<td>20,282</td>
</tr>
<tr>
<td>First-line supervisors of construction trades and extraction workers</td>
<td>729,497</td>
</tr>
<tr>
<td>Glaziers</td>
<td>39,124</td>
</tr>
<tr>
<td>Mining machine operators</td>
<td>47,317</td>
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<tr>
<td>Pipelayers, plumbers, pipefitters, and steamfitters</td>
<td>503,334</td>
</tr>
<tr>
<td>Structural iron and steel workers</td>
<td>50,645</td>
</tr>
<tr>
<td>Food preparation and serving related occupations</td>
<td>347,626</td>
</tr>
<tr>
<td>Chefs and head cooks</td>
<td>347,626</td>
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<tr>
<td>Healthcare practitioners and technical occupations</td>
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<td>Audiologists</td>
<td>927</td>
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<tr>
<td>Chiropractors</td>
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<tr>
<td>Clinical laboratory technologists and technicians</td>
<td>152,214</td>
</tr>
<tr>
<td>Dental hygienists</td>
<td>115,444</td>
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<tr>
<td>Diagnostic related technologists and technicians</td>
<td>245,205</td>
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<tr>
<td>Dietitians and nutritionists</td>
<td>25,531</td>
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<tr>
<td>Emergency medical technicians and paramedics</td>
<td>139,476</td>
</tr>
<tr>
<td>Health diagnosing and treating practitioners, all other</td>
<td>5,554</td>
</tr>
<tr>
<td>Health practitioner support technologists and technicians</td>
<td>418,491</td>
</tr>
<tr>
<td>Licensed practical and licensed vocational nurses</td>
<td>749,084</td>
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<tr>
<td>Medical records and health information technicians</td>
<td>144,144</td>
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<tr>
<td>Miscellaneous health technologists and technicians</td>
<td>91,556</td>
</tr>
<tr>
<td>Nurse anesthetists</td>
<td>2,142</td>
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<tr>
<td>Nurse practitioners</td>
<td>4,617</td>
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<tr>
<td>Occupational therapists</td>
<td>6,870</td>
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<tr>
<td>Opticians, dispensing</td>
<td>46,859</td>
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<tr>
<td>Other healthcare practitioners and technical occupations</td>
<td>45,169</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>6,560</td>
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<tr>
<td>Physical therapists</td>
<td>11,157</td>
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<tr>
<td>Physician assistants</td>
<td>5,891</td>
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<tr>
<td>Physicians and surgeons</td>
<td>5,601</td>
</tr>
<tr>
<td>Radiation therapists</td>
<td>9,173</td>
</tr>
<tr>
<td>Recreational therapists</td>
<td>2,203</td>
</tr>
<tr>
<td>Registered nurses</td>
<td>1,143,855</td>
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<tr>
<td>Respiratory therapists</td>
<td>71,674</td>
</tr>
<tr>
<td>Speech-language pathologists</td>
<td>2,631</td>
</tr>
<tr>
<td>Therapists, all other</td>
<td>28,171</td>
</tr>
</tbody>
</table>
### TABLE SA3-5

**Skilled technical workforce occupations and employment in the American Community Survey: 2017**

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation, maintenance, and repair occupations</td>
<td>3,342,386</td>
</tr>
<tr>
<td>Aircraft mechanics and service technicians</td>
<td>145,131</td>
</tr>
<tr>
<td>Automotive service technicians and mechanics</td>
<td>719,165</td>
</tr>
<tr>
<td>Bus and truck mechanics and diesel engine specialists</td>
<td>254,358</td>
</tr>
<tr>
<td>Computer, automated teller, and office machine repairers</td>
<td>115,042</td>
</tr>
<tr>
<td>Electric motor, power tool, and related repairers</td>
<td>19,380</td>
</tr>
<tr>
<td>Electrical and electronics repairers, industrial and utility</td>
<td>11,456</td>
</tr>
<tr>
<td>Electronic equipment installers and repairers, motor vehicles</td>
<td>5,992</td>
</tr>
<tr>
<td>Electronic home entertainment equipment installers and repairers</td>
<td>31,129</td>
</tr>
<tr>
<td>First-line supervisors of mechanics, installers, and repairers</td>
<td>222,437</td>
</tr>
<tr>
<td>Heating, air conditioning, and refrigeration mechanics and installers</td>
<td>352,308</td>
</tr>
<tr>
<td>Heavy vehicle and mobile equipment service technicians and mechanics</td>
<td>178,049</td>
</tr>
<tr>
<td>Industrial and refractory machinery mechanics</td>
<td>330,052</td>
</tr>
<tr>
<td>Locksmiths and safe repairers</td>
<td>22,143</td>
</tr>
<tr>
<td>Maintenance and repair workers, general</td>
<td>450,626</td>
</tr>
<tr>
<td>Maintenance workers, machinery</td>
<td>20,987</td>
</tr>
<tr>
<td>Millwrights</td>
<td>34,573</td>
</tr>
<tr>
<td>Other installation, maintenance, and repair workers</td>
<td>222,753</td>
</tr>
<tr>
<td>Precision instrument and equipment repairers</td>
<td>47,805</td>
</tr>
<tr>
<td>Radio and telecommunications equipment installers and repairers</td>
<td>111,152</td>
</tr>
<tr>
<td>Riggers</td>
<td>11,626</td>
</tr>
<tr>
<td>Small engine mechanics</td>
<td>36,222</td>
</tr>
<tr>
<td>Life, physical, and social science occupations</td>
<td>176,698</td>
</tr>
<tr>
<td>Agricultural and food science technicians</td>
<td>22,472</td>
</tr>
<tr>
<td>Atmospheric and space scientists</td>
<td>1,511</td>
</tr>
<tr>
<td>Biological technicians</td>
<td>9,661</td>
</tr>
<tr>
<td>Chemical technicians</td>
<td>38,813</td>
</tr>
<tr>
<td>Chemists and materials scientists</td>
<td>5,580</td>
</tr>
<tr>
<td>Geological and petroleum technicians</td>
<td>12,971</td>
</tr>
<tr>
<td>Medical scientists</td>
<td>2,769</td>
</tr>
<tr>
<td>Miscellaneous life, physical, and social science technicians</td>
<td>75,021</td>
</tr>
<tr>
<td>Miscellaneous social scientists and related workers</td>
<td>5,622</td>
</tr>
<tr>
<td>Urban and regional planners</td>
<td>2,278</td>
</tr>
<tr>
<td>Management occupations</td>
<td>451,544</td>
</tr>
<tr>
<td>Architectural and engineering managers</td>
<td>26,560</td>
</tr>
<tr>
<td>Computer and information systems managers</td>
<td>159,209</td>
</tr>
<tr>
<td>Medical and health services managers</td>
<td>264,299</td>
</tr>
<tr>
<td>Natural sciences managers</td>
<td>1,476</td>
</tr>
<tr>
<td>Material moving occupations</td>
<td>71,244</td>
</tr>
<tr>
<td>Crane and tower operators</td>
<td>53,368</td>
</tr>
<tr>
<td>Pumping station operators</td>
<td>17,876</td>
</tr>
<tr>
<td>Office and administrative support occupations</td>
<td>78,599</td>
</tr>
<tr>
<td>Computer operators</td>
<td>53,197</td>
</tr>
<tr>
<td>Office machine operators, except computer</td>
<td>25,402</td>
</tr>
<tr>
<td>Personal care and service occupations</td>
<td>23,019</td>
</tr>
<tr>
<td>Morticians, undertakers, and funeral directors</td>
<td>23,019</td>
</tr>
<tr>
<td>Production occupations</td>
<td>2,637,706</td>
</tr>
<tr>
<td>Aircraft structure, surfaces, rigging, and systems assemblers</td>
<td>7,372</td>
</tr>
<tr>
<td>Bakers</td>
<td>166,992</td>
</tr>
<tr>
<td>Computer control programmers and operators</td>
<td>82,028</td>
</tr>
</tbody>
</table>
### TABLE SA3-5

**Skilled technical workforce occupations and employment in the American Community Survey: 2017**

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine and other machine assemblers</td>
<td>7,729</td>
</tr>
<tr>
<td>First-line supervisors of production and operating workers</td>
<td>735,137</td>
</tr>
<tr>
<td>Furnace, kiln, oven, drier, and kettle operators and tenders</td>
<td>8,640</td>
</tr>
<tr>
<td>Machinists</td>
<td>312,964</td>
</tr>
<tr>
<td>Miscellaneous plant and system operators</td>
<td>41,595</td>
</tr>
<tr>
<td>Prepress technicians and workers</td>
<td>21,074</td>
</tr>
<tr>
<td>Production workers, all other</td>
<td>1,042,583</td>
</tr>
<tr>
<td>Stationary engineers and boiler operators</td>
<td>66,260</td>
</tr>
<tr>
<td>Structural metal fabricators and fitters</td>
<td>23,203</td>
</tr>
<tr>
<td>Tool and die makers</td>
<td>48,861</td>
</tr>
<tr>
<td>Water and wastewater treatment plant and system operators</td>
<td>73,268</td>
</tr>
<tr>
<td>Protective service occupations</td>
<td>208,453</td>
</tr>
<tr>
<td>Firefighters</td>
<td>208,453</td>
</tr>
<tr>
<td>Sales and related occupations</td>
<td>10,316</td>
</tr>
<tr>
<td>Sales engineers</td>
<td>10,316</td>
</tr>
<tr>
<td>Transportation occupations</td>
<td>53,716</td>
</tr>
<tr>
<td>Sailors and marine oilers</td>
<td>20,224</td>
</tr>
<tr>
<td>Transportation inspectors</td>
<td>33,492</td>
</tr>
</tbody>
</table>

**Note(s)**

The American Community Survey does not cover employment among self-employed workers and employment in private households. Employment estimates are of employed individuals aged 25 and older. Values do not include those employed in military occupations.

**Source(s)**

Census Bureau, American Community Survey (ACS), 2017, Public Use Microdata Sample (PUMS).

*Science and Engineering Indicators*
Notes

1. The Rothwell publication can be found at http://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pga_167744.pdf.

2. OES employment data as published may have aggregations or suppressions. SOC codes that appear in the OES data but not the O*NET data were assigned imputed knowledge and education scores based on the mean of the values assigned to matching 5-digit codes. If matching 5-digit codes were not available, matching 4-digit codes were used.

3. This follows Rothwell’s method of imputation between 5- and 6-digit categories (see page 9 of http://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pga_167744.pdf).