Fact Sheet 2010

SCIENTISTS AND ENGINEERS: VITAL STATISTICS

Current Numbers, Recent Growth and Decline

- In 2009, 3,481,000 workers in professional and related occupations were employed in computer and mathematical occupations, while 2,740,000 were employed in architecture and engineering occupations and 1,328,000 in life and physical science occupations. Together they accounted for 24.6% of the professional labor force.[1]
- From 2004–09 the total number of people employed in professional and related occupations in the U.S. increased by 4%, while:[2]
  - Aerospace engineers increased by 9%, and civil engineers by almost 7%.[3]
  - Mechanical engineers decreased by 1.5%.[4]
  - Among the natural sciences, the number of chemists and materials scientists decreased 11%.[5]
  - The number of medical scientists increased by 29.3%.[6]
  - The number of drafters decreased by over 16%.[7]

2008–18 Job Projections Reflect Offshoring of High-Tech and IT Jobs

The latest projections by the U.S. Department of Labor, Bureau of Labor Statistics (BLS) show that due to the increasing exodus of highly skilled jobs overseas, half of the top thirty occupations expected to experience the largest job growth from 2008–18 are low-wage or very low-wage occupations.

- While offshoring has slowed during the global economic downturn, it has by no measure stopped. In a 2009 interview with the *New York Times*, one offshoring executive noted that he only expected his unit to grow 25 to 30 percent that year. In previous years, the same unit had grown 40 to 50 percent per year.[8]
- In the 2008–18 projections, network systems and data communications analysts are predicted to be the second fastest-growing job in America. Computer software engineers are growing rapidly both in terms of speed and size.[9]
- BLS projected that from 2004–14, 794,000 high-tech jobs would be generated by the six most rapidly growing occupations, an average annual increase of 79,400 jobs.[10] Between 2006 and 2016, BLS anticipated an average annual increase of only 64,500 high-tech jobs from the five high-tech occupations expected to grow most rapidly.[11] Between 2008 and 2018, BLS anticipates an annual increase of only 58,360 jobs in the same occupations.[12]
- Comparing the five most rapidly growing occupations from the 2006–16 projection period with the 2008–18 projections for those same high-tech occupations, some areas will see less growth while others will see more:
  - 43,100 less computer software engineers, applications;
  - 66,000 more computer software engineers, systems software;

- 9,700 less computer systems analysts;
- 45,800 more network systems and data communications analysts;
- 9,300 less database administrators.

- In all, nearly 61,400 fewer high-tech jobs are anticipated in the 2008–18 period—just 90% of the 645,000 high-tech jobs originally projected in 2006 to be created by the most rapidly growing tech occupations.[13]
- BLS projections for 2008–18 put no high-tech jobs among the top ten occupations expected to create the most new jobs, with only two in the top thirty.[14]
- While high-tech job growth in the U.S. slows, analysis of imports from 2001 through 2005 shows that payments for foreign computer and information services may have nearly doubled in these five years, while those for imported research, development, and testing services may have nearly tripled.[15]

Other Employment Changes, 2008–18

- In 2008–18, life scientists are projected to increase by almost 26.7% and physical scientists by about 15.1%. Mathematical scientists are projected to increase by 19.8%. The largest percentage increases in these areas are expected in medical scientists, except epidemiologists (40.4%), biochemists and biophysicists (37.4%), and environmental scientists (24.5%).[16]
- Jobs in the engineering field in general are projected to increase by 11.3% between 2008 and 2018, slightly more than the 10.1% anticipated for the work force as a whole. The greatest increases are expected in biomedical engineering (72%) and environmental engineering (30.6%).[17]
- Engineering technicians, excluding drafters, are projected to increase by 5.2%; drafters are expected to increase by 4.2%.[18]
- Life, physical, and social science technicians are projected to increase by 12.4%. Biological technicians are expected to increase by 17.6%.[19]

Offshoring and Immigration Policy Challenges the Entry-Level Workforce

Data from the Current Population Survey (CPS) indicates that the long trend of strong U.S. demand for scientific and technical specialists ended after 2001 and had not resumed by 2006. Possible explanations for these changes are the increase of foreign workers on temporary visas in the United States and offshoring of science and technology jobs.[20]

- The primary immigration policy affecting professional employees, particularly those in science and technology fields, is the H-1B visa program. The H-1B visa program allows an employer to temporarily employ foreign workers in a specialty occupation.[21] Currently there is a cap on the number of H-1B visa holders set at 65,000 workers but it has been as high as 195,000 in the recent past.[22] The H-1B visa is available for foreign workers to stay in the United States for up to three years and is renewable for up to six years.[23]
- The number of H-1B visa workers in the U.S. is larger than it appears. There are several exemptions to the cap which allow more than the allotted 65,000 H-1B workers into the U.S.
  - First, there is no numerical limit for H-1B visas for institutions of higher education or non-profit organizations or their affiliates. These visas are not counted under the cap.[24]
  - Second, in 2004, another exemption created a cap loophole by adding an additional 20,000 annual allotment for U.S.-educated foreign workers with advanced degrees. More than 31,000 applications were received in 2009 for H-1B visas under this exemption.[25]

- Third, an additional 6,800 visas may be set within the cap each fiscal year under the terms of the U.S.-Chile and U.S.-Singapore Free Trade Agreements (these visas are called H-1B1 visas). Unused numbers in this pool are made available for H-1B use for the next fiscal year.[26]
- Furthermore, since the "temporary" H-1B visa is good for up to six years, according to government data some 125,000 existing visa holders renew annually.

- As a result of these cap exemptions, under current law **276,252 foreign professionals received new or renewed guest worker visas in FY 2008.**[27]
- Between 2008 and 2018, the Department of Labor estimates that employment in professional and related occupations will grow by 16.8% and add more than 5.2 million new jobs by 2018 (520,000 annually).[28] Yet between 2006 and 2008 alone, the Department of Homeland Security (DHS) approved 828,677 H-1B visa applications for highly-skilled immigrants.[29] In 2008, DHS approved 276,525 H-1B visa applications. Of these approved visa applications, 137,010 H-1B applications were in computer-related occupations; 30,062 in architecture, engineering, and surveying occupations; 6,990 in life sciences; and 5,933 in mathematical and physical sciences.[30]
- Despite the provision of the law stating that H-1B visa holders must be paid the prevailing wage, foreign guest workers make less than their American counterparts in the same occupations and locations.
  - H-1B visa program keeps IT wages from rising. According to a Congressional study conducted by the National Research Council, "**the current size of the H-1B workforce relative to the overall number of IT professionals is large enough to keep wages from rising** as fast as might be expected in a tight labor market".[31]
  - Between 2005 and 2009, the median weekly earnings for computer systems analysts and scientists increased from $1,210 to $1,245 (in current dollars), which after adjusting for inflation represents an annual average increase of about 0.36%.[32] For computer operations and systems researchers and analysts the median wages decreased from $1,389 to $1,248 from 2005 to 2009, which after adjusting for inflation represents an annual average decrease of 1.3%.[33] While the current numbers increased overall during this period, the rate was unstable and fluctuated considerably. For computer programmers, the average weekly wage increased from $1,205 in 2005 to $1,243 in 2009, which after adjusting for inflation amounts to an increase of 0.39% annually.[34]

Median Weekly Earnings Vary in 2009

- Median weekly earnings for engineers ranged from a high of $1,551 for chemical engineers to a low of $1,280 for industrial engineers in 2009.[35]
- For computer-related fields, median weekly earnings ranged from a high of $1,493 for computer software engineers to a low of $915 for computer support specialists. Natural scientists, physical scientists other than chemists and environmental scientists earned a high of $1,422, while medical scientists earned the low of $1,102.[36]
- Among engineering and related technologists and technicians, surveying and mapping technicians earned the least, $764, while engineering technicians other than drafters earned the most, $937.[37]
- Women and minorities are largely concentrated in lower-paying technical occupations.[38]

Location Matters

In 2005, high-tech opportunities differed by state, and more rural states had fewer jobs:

- Maryland, Massachusetts, Virginia, Colorado and Washington had the highest proportion of science and engineering jobs (6.8% to 8.4% of the workforce).
- The median earnings of workers in these states ranged from $38,871 to $45,659.
- Arkansas, Wyoming, Kentucky, Mississippi, and South Dakota had the lowest rates, from 2.4% to 3.3%.
- Median earnings in the states with low numbers of high-tech workers ranged from $29,467 to $33,203.[39]

Educational Requirements and the Declining Number of IT Students

The increase in offshoring of junior IT jobs (from entry level programmers to end-user support) means that there are less job opportunities for recent graduates and fewer incentives for students to major in computer science or related fields.[40]

About two-thirds of the IT workforce has a bachelor's degree or higher. The fields of study are:

- 46% in IT and Computer Engineering,
- 26% in Math and Science,
- 14% in Other Engineering,
- 6% in Business,
- 8% in Other.[41]

The 2004–05 Taulbee Survey reports that enrollment in computer science and engineering degree programs has dropped since its peak in 2002–03.[42]

The number of undergraduate IT majors has declined by 23% in 2003–04, 10% in 2004–05, and 21% in 2005–06.[43]

Researchers believe the fall off in recent enrollment is significant but not justified in terms of job prospects. Instead, they see an over-focus on computer science and software engineering degrees as a source of IT workers, since less than a third of the workforce have these degrees.[44]

Highly qualified U.S. students are citing uncertainty in the future of domestic science and engineering resulting from an increasing H-1B workforce and increased outsourcing as a motivating factor in causing them to pursue other career opportunities.[45]

Women's Situation

Women's participation in science, engineering, and technical occupations increased from 1995–2008, although women are still underrepresented in many fields, particularly in mathematical and computer science and engineering.

- Women are well-represented in medical and biological sciences, where they were 52.3% and 52.5%, respectively, of the scientists in 2008. However, they accounted for less than 25.6% of environmental and geoscientists in 2008.[46]
- In 2008, women comprised 13.5% of the engineering workforce. A study by the Commission on Professionals in Science and Technology found that this is only a small increase since 1983. The largest proportion of women was in environmental engineering, where women were 24% of the field. On the low end, only 6.6% of mechanical engineers were women.[47]

- Eighteen point five percent of engineering technicians were women in 2008, along with 35.8% of chemical technicians.[48]
- In 2005–06 women earned 17.8% of bachelor's degrees, 23.5% of master's degrees, and 20.2% of doctorates in engineering and engineering technologies. They also earned 41.7% of bachelor's degrees, 39.7% of master's degrees, and 30% of doctorates in physical sciences and science technologies.[49] In 2005–06 as in 2001, women earned the majority of bachelor's and master's degrees in biological/life sciences.[50]
- Women increased their presence in natural sciences, particularly in medical science and psychology where they now account for more than half of total employment. The only other comparable area is other life, physical and social science technicians where women make up 55.2% of the workforce.[51]
- In computer science, the percentage for women in these jobs was lower in 2002 than in 1983. Yet, the overall growth in this field was so strong that the absolute numbers of women in the field rose through the year 2000 and then started to decline.[52] In 2008, 230,000 women were employed as computer scientists and systems analysts, comprising 27.5% of the workforce.[53]
- In almost every field, men's weekly median earnings were approximately 20% higher than women's.[54]
- While women in science and engineering occupations are still paid less than men, they tend to earn more than similarly educated women in other sectors of the workforce. The average starting salary for someone with a bachelor's degree in mechanical engineering, for example, was just over $59,000. By comparison, the average starting salary for an individual with a bachelor's degree in economics was just under $50,000.[55]

Blacks and Hispanics: Underrepresented and Underpaid

Blacks and Hispanics are severely underrepresented in science and engineering:

- In 2009, Blacks were nearly 11% of the labor force, but only 6% of life, physical and social scientists, 6.7% of computer science and mathematical occupations, and 5.5% of engineering occupations.[56]
- Blacks held 9.4% of engineering technician positions in 2009; they were also poorly represented among chemical technicians, where they constituted 18.2% of this (relatively lower-paying) occupation.[57]
- Participation in science and engineering occupations is even lower for persons of Hispanic origin. Hispanics were 14% of the labor force in 2009, but only 5.9% of life, physical and social scientists, 5.4% of computer and mathematical occupations, and 7.2% of engineers.[58]
- Hispanics were more equally represented in technician and technologist occupations, at 18.7% of chemical technicians, and over 8.3% of engineering technicians in 2009.[59]
- In nearly every science and engineering occupation, white men's median weekly earnings were higher in 2008 than those of Black men and women, Hispanic men and women, and white women.[60]
- Among math and computer scientists, white men earned 10.2% more than Black men, almost 13.2% more than Hispanic men, 16.2% more than white women, 26.2% more than Black women, and 39.4% more than Hispanic women.[61]

- Among scientists and engineers, Blacks and Hispanics were more likely than whites to be unemployed in 2002. Among technicians and technologists, Blacks were more likely to be unemployed than either whites or Hispanics.[62]

Union Membership

- Union membership fluctuated between 1998 and 2008 within these occupations, increasing slightly among scientists and declining slightly among engineers and technicians.[63]
- In 2009, 10% of professionals employed in life, physical or social science related occupations were union members and 7.7% of professionals in architecture and engineering occupations were union members.[64]
- In 2008, the highest union membership rate in the sciences was among conservation scientists and foresters (12.7%); in engineering, among environmental engineers (12%); and among engineering technicians (15.8%) and aerospace engineers (11.8%).[65]
- Among those technologists and technicians for which data is available (engineering technicians other than drafters), unionized workers earned an average of $26.60 an hour, compared to an average hourly wage of $22.41 for non-unionized workers. This amounts to a wage premium of nearly 16% for those belonging to unions.[66]
- In some cases, scientists and engineers who are non-union earn more than those who are union members. This is because a far greater proportion of scientists and engineers in government and academia are organized than in the higher-paying private industry, where most scientists and engineers work.[67]

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For further information on professional workers, check out DPE's Web site: www.dpeaflcio.org

The Department for Professional Employees, AFL-CIO (DPE) comprises 23 AFL-CIO unions representing over four million people working in professional, technical and administrative support occupations. DPE-affiliated unions represent: teachers, college professors, and school administrators; library workers; nurses, doctors, and other health care professionals; engineers, scientists, and IT workers; journalists and writers, broadcast technicians, and communications specialists; performing and visual artists; professional athletes; professional firefighters; psychologists, social workers and many others. DPE was chartered by the AFL-CIO in 1977 in recognition of the rapidly-growing professional and technical occupations.

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