



## SCIENTISTS AND ENGINEERS: VITAL STATISTICS

### Current Numbers, Recent Growth

- In 2004, 3,140,000 professional and technical workers were employed in computer and mathematical occupations, while 2,553,000 were employed in engineering occupations and 1,056,000 in life and physical science occupations. Together they accounted for 24% of the professional and technical labor force.<sup>1</sup>
- From 1994–2004 the total number of jobs in the U.S. increased by 13.5%, while\*:
  - Aerospace engineers increased by 112%, and civil engineers by almost 61%<sup>2</sup>
  - Chemical engineers increased by 37%<sup>3</sup>
  - Mechanical engineering jobs increased by less than the overall rate of job growth, growing only 12.6%<sup>4</sup>
  - Among the natural sciences, the number of chemists and materials scientists increased 36%, and environmental and geoscientists grew by 78%. The number of medical scientists increased 120%<sup>5</sup>
  - Survey and mapping technicians increased by 63%, and the number of drafters increased by 18%<sup>6</sup>

### 2002–2012 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, the vast majority of occupations expected to experience the largest job growth from 2002–2012 are low-wage service occupations. This is in sharp contrast to previous projections (for 2000–2010), which predicted an IT boom:

- In the 2000–2010 projections, highly skilled computer occupations accounted for the seven most rapidly growing occupations, and eight of the top 10. These occupations were also expected to add the most jobs—some two million—from 2000–2010. In contrast, only one computer occupation—network systems and data communications analyst—is now ranked among the seven occupations expected to grow most rapidly from 2002–2012.<sup>7</sup>
- BLS projected that from 2000–2010, 1.53 million high tech jobs would be generated by the seven most rapidly growing occupations, an average annual increase of 152,000 jobs. Now BLS anticipates an average annual increase of only 10,600 high tech jobs from the seven occupations expected to grow most rapidly from 2002–2012.<sup>8</sup>
- Comparing the 10 most rapidly growing occupations for these two projection periods, we find an annual reduction of 137,300 high tech jobs.
- This translates to the following annual reductions in the number of anticipated jobs:
  - 25,000 computer software engineers, applications
  - 15,600 computer software engineers, systems software

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\* Note: Due to 2003 changes in BLS occupational classification reporting, comparative 1994–2004 figures are approximations calculated using BLS’s “Conversion factors for the Census occupational and industry classifications, Table 5: *Distribution of employment from the 1990 to the 2002 Census Occupational Classification by detailed occupation*” (<http://www.bls.gov/cps/cpsoccind.htm>).

- 49,000 computer support specialists
- 2,500 desktop publishers
- 18,700 network and computer systems analysts
- 7,000 database administrators
- This amounts to a total of 1.37 million lost jobs between 2002 and 2012, or 77% of the 1.8 million jobs originally projected in 2000 to be created by the ten most rapidly growing occupations.<sup>9</sup>
- § Only one IT job is expected to increase from 2002–2012: Network systems analyst and data communications analyst projections exceeded those for 2000–2010 by an annual average of 1,400.<sup>10</sup>
- § BLS projections for 2000–2010 put two IT jobs among the top ten for largest (numerical) job growth—computer support specialists and computer software engineers. For the adjusted 2002–2012 forecast, there are no high tech or knowledge jobs among the 10 occupations expected to create the most new jobs.<sup>11</sup>

### **Other Employment Changes, 2002–2012**

- Projected increases in the life, physical, and mathematical science occupations in the 2002–2012 projections are similar to the previous projections for 2000–2010. Life scientists should increase by over 18% and physical scientists by about 14.5%. Mathematical scientists are projected to increase by 7.4%. The largest increases in these areas are expected in medical science (27.3%), particularly epidemiology (32.5%); biological science (19%); and environmental and geoscience (20.1%).<sup>12</sup>
- Employment growth for engineers is projected at 7.3%, less than the 14.8% anticipated for the work force as a whole. The greatest increases are expected in biomedical engineering (26.1%) and environmental engineering (38.2%). Losses are expected in petroleum engineering, aerospace engineering, nuclear engineering, mining and geological engineering, and marine engineering.<sup>13</sup>
- Engineering technicians, excluding drafters, will increase by 10%; drafters will increase by only 2.8%, far below the previous projection of a 19.5% increase.<sup>14</sup>
- Life, physical, and social science technicians are projected to increase by 14.8%, a smaller increase than the previously anticipated 19%. Biological technicians are expected to increase by 19.4%, down from the more than 26% projected for 2000–2010.<sup>15</sup>

### **Median Weekly Earnings Vary in 2004**

- Median weekly earnings for engineers ranged from a high of \$1,347 for aerospace engineers to a low of \$1,135 for civil engineers in 2004.<sup>16</sup>
- For scientists, median weekly earnings for mathematical and computer scientists ranged from a high of \$1,350 for computer software engineers to a low of \$1,027 for computer systems analysts and scientists. Among natural scientists, physicists and astronomers earned the high of \$1,777, while zoologists and wildlife biologists earned the low of \$968.<sup>17</sup>
- Among engineering and related technologists and technicians, aerospace engineering and operations technicians earned the most (\$1,010) while civil engineering technicians earned the least (\$740).<sup>18</sup>
- Among science technicians, nuclear technicians earned the most (\$1,138), while forest and conservation technicians earned the least (\$525).<sup>19</sup>
- More women and minorities are in lower than in higher paying technical occupations.<sup>20</sup>

## **Women's Situation**

Women's participation in science, engineering, and technical occupations increased from 1994–2004, although they are still underrepresented in many fields, particularly in mathematical and computer science and engineering.

- In 2004, female natural scientists comprised over 39% of the field. In contrast, women represented 46.5% of the overall labor force in 2004, and accounted for over 56% of the professional labor force.<sup>21</sup>
- § Women are well-represented in medical and biological sciences, where they were 53% and 45%, respectively, of the scientists in 2004. However, they accounted for less than 30% of environmental and geoscientists in 2004.<sup>22</sup>
- § In 2004, nearly 16% of engineers were women. The largest proportion of women was in computer software engineering, where women were 25% of the field. On the low end, only 5.8% of mechanical engineers were women.<sup>23</sup>
- § Almost 20% of engineering technicians were women in 2004, along with 33% of chemical technicians.<sup>24</sup>
- The percentage of women earning bachelor's, master's, and doctoral degrees in the sciences, engineering, and related technologies increased from 1990–2000, except for a slight decline in bachelor's degrees in computer sciences. In 2000 as in 1990, women earned the majority of bachelor's and master's degrees in biological/life sciences.<sup>25</sup>
- § In almost every field, men's weekly median earnings were approximately 20% higher than women's.<sup>26</sup>
- § The gap in pay between male and female operations and systems researchers and analysts and between male and female computer programmers increased from 1994–2004. In these years, Congress greatly increased the number of (mostly male) H-1B guest workers permitted to enter the country, mostly to work in IT. This exacerbated the under-representation and wage gap for women, Blacks and Hispanics in these occupations.<sup>27</sup>

## **Blacks and Hispanics: Underrepresented and Underpaid**

Blacks and Hispanics are severely underrepresented in science and engineering:

- § In 2004, Blacks were 10.7% of the labor force, but only 5.1% of natural scientists, 7.5% of math and computer scientists, and 5% of engineers.<sup>28</sup>
- § Blacks held 6.8% of science technician positions and 5.9% of engineering technician positions.<sup>29</sup>
- § Participation in science and engineering occupations is even lower for persons of Hispanic origin. Hispanics were 12.9% of the labor force in 2004, but only 3% of natural scientists, 5.5% of math and computer scientists, and 4.3% of engineers.<sup>30</sup>
- § Hispanics were more equally represented in technician and technologist occupations, at 6.9% of science technicians, and almost 9% of engineering technicians in 2004.<sup>31</sup>
- § In nearly every science and engineering occupation, white men's median weekly earnings were higher in 2001 than those of Black men and women, Hispanic men and women, and white women.<sup>32</sup>
- § Among math and computer scientists, white men earned 11.7% more than Black men, almost 19% more than Hispanic men, 23% more than white women, 29.4% more than Black women, and 23.1% more than Hispanic women.<sup>33</sup>

§ 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.<sup>34</sup>

### **Union Membership**

- Union membership fluctuated between 1994 and 2004 within these occupations, increasing slightly among scientists and declining slightly among engineers and technicians.<sup>35</sup>
- § In 2004, the highest union membership rate in the sciences was among environmental and geoscientists (10.7%); in engineering, among civil engineers (12.2%); and among biological technicians (17.2%) and engineering technicians (18.6%).<sup>36</sup>
- § Among technologists and technicians, unionized workers earned an average of \$22.76 an hour, compared to an average hourly wage of \$19.68 for non-unionized workers.<sup>37</sup>
- § In some cases, scientists and engineers who are nonunion 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.<sup>38</sup>

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<sup>1</sup> U.S. Department of Labor, Bureau of Labor Statistics, <http://www.bls.gov/cps/home.htm#annual>, Table 11.

<sup>2-6</sup> U.S. Department of Labor, Bureau of Labor Statistics, *Ibid; Employment and Earnings*, Vol. 40, No. 1, Table 11.

<sup>7-15</sup> Hecker, Daniel, "Occupational Employment Projections to 2010," U.S. Department of Labor, *Monthly Labor Review*, November 2001; "Occupational Employment Projections to 2012", U.S. Department of Labor, *Monthly Labor Review*, February 2004.

<sup>16-20</sup> U.S. Department of Labor, Bureau of Labor Statistics, <http://www.bls.gov/cps/home.htm#annual>, Table 39;

U.S. Department of Labor, Bureau of Labor Statistics, [http://www.bls.gov/oes/oes\\_dl.htm](http://www.bls.gov/oes/oes_dl.htm)

<sup>21-24</sup> U.S. Department of Labor, Bureau of Labor Statistics, <http://www.bls.gov/cps/home.htm#annual>, Table 11; Vol. 40, No. 1, Table 11.

<sup>25</sup> National Science Foundation, Scientists and Engineers Statistical Data System (SESTAT), [www.nsf.gov/sbe/srs/srsdata.htm#SESTAT](http://www.nsf.gov/sbe/srs/srsdata.htm#SESTAT).

<sup>26</sup> U.S. Department of Labor, Bureau of Labor Statistics, <http://www.bls.gov/cps/home.htm#annual>, Table 39.

<sup>27</sup> *Ibid; Employment and Earnings*, Vol. 43, Table 39.

<sup>28-31</sup> *Employment and Earnings*, <http://www.bls.gov/cps/home.htm#annual>, Table 39.

<sup>32-34</sup> Scientists and Engineers Statistical Data System (SESTAT), *op. cit.*

<sup>35-38</sup> BNA Plus, *Union Membership and Earnings: Compilations from the Current Population Survey*, 2001 and 2003 editions.

*The Department for Professional Employees, AFL-CIO (DPE) comprises 22 AFL-CIO unions representing over four million people working in professional, technical and administrative support occupations. DPE-affiliated unions represent: scientists, engineers, and IT workers; journalists and writers, broadcast technicians, and communications specialists; librarians, teachers, college professors, and school administrators; nurses, doctors, and other health care professionals; performing and visual artists; professional athletes, social workers, psychologists, and many others. DPE was chartered in 1977 in recognition of the fast-growing professional, technical and other highly skilled white collar occupations.*