

A Concise Look at Occupations in the Life and Physical Sciences

By John I. Jones

Some of the most exciting discoveries in recent years have come out of research in the life and physical sciences. From bioengineered crops to new medical treatments, a plethora of new products and technologies have been spawned by people working in these fields. This article uses Occupational Employment Statistics data to examine employment and wages of life and physical scientists. Following a national overview of these occupations, the paper looks at the distribution of employment for all life and physical science occupations across industries, as well as inter-industry wage differentials for these occupations. Finally, the last section examines state-level employment and wage information for selected life and physical science occupations.

National Overview of the Life and Physical Science Occupations

The life sciences are those branches of science, such as biology, medicine, and ecology that focus on living organisms and their organization, life processes, and relationships to each other and their environment. The physical sciences, on the other hand, focus on energy and non-living matter, and include such scientific fields as physics, chemistry, astronomy, and geology. Occupations in these fields are listed in table 1, along with their employment and mean wages. Among the life sciences occupations, medical scientists, except epidemiologists, is the largest occupation, with employment of 73,670, followed by biochemists and biophysicists, with employment of 17,690. At the other end of the scale, the smallest occupations are animal scientists with employment of 3,000 and epidemiologists with employment of 3,630. The physical science occupations with the most employment are chemists, with employment of 76,540, and environmental scientists and specialists, including health, with employment of 72,000. Some of the smallest occupations in the physical science are astronomers with employment of 970 and atmospheric and space scientists with employment of 7,050.

Average wages for all of the life and physical science occupations are above average. These high wages reflect the high educational requirements for these occupations. The highest average hourly mean wage in the life sciences group is \$36.21 (\$75,320 annually) for biochemists and biophysicists. This is nearly twice the national average. Medical scientists, except epidemiologists, have the next highest wage, with an hourly mean of \$33.24 (\$69,140 annually). In the physical sciences group, the leading average hourly wage of \$48.64 (\$101,120 annually) belongs to astronomers. This is over two and half times the national average. The next highest average hourly wage belongs to physicists, whose wage is \$43.98 (\$91,480 annually). Conversely, the lowest average wage in the life sciences group is that of animal scientists, with an hourly wage of \$22.88 (\$47,590 annually). The lowest average hourly wage for the physical sciences group is that of environmental scientists and specialists, including health, with a wage of \$27.63 (\$57,470 annually).

Employment and wages by industry

Employment of these occupations is concentrated in a few industries. Table 2 shows the industries with the highest employment for both groups. Tables 3 through 8 show the employment and wages for the life and physical science occupations for six selected industries. Scientific research and development services is the industry that employs the highest numbers of both types of scientists. Federal government, colleges and universities, state government, and pharmaceutical and medicine manufacturing also employ large numbers of both types of scientists. All of these industries employ several different types of scientists, although employment tends to be concentrated in a few occupations. Every occupation in the life and physical sciences has employment in the government, and almost all are found in scientific research and development services. Government is the largest employer of over half of the occupations, including: soil and plant scientists; zoologists and wildlife biologists; all other biological scientists; conservation scientists; foresters; epidemiologists; astronomers; atmospheric and space scientists; environmental scientists and specialists, including health; hydrologists,

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and all other physical scientists. Science employment in state and local government is concentrated in environmental scientists and specialists, including health.

The three largest employers of environmental scientists and specialists, including health, are state government (18,300), management and technical consulting services (14,510), and architectural and engineering services (10,790). Different levels of government represent 3 of the 5 largest employers of this occupation. Local government (10,230) ranks fourth in employment, while federal government (5,170) ranks fifth. These rankings may reflect the rise in safety and environmental awareness and regulation in American society, as well as government's central role in regulatory issues.¹ Similarly, government is also the largest employer of conservation scientists, zoologists and wildlife biologists, and foresters accounting for 86, 63, and 60 percent of the occupation's employment respectively.

The occupations that aren't concentrated in government tend to be concentrated in three industries: scientific research and development services, colleges and universities, and pharmaceutical and medicine manufacturing. For example, over three-quarters of biochemists and biophysicists are employed in three industries: scientific research and development services (8,110 workers), pharmaceutical and medicine manufacturing (4,260 workers), and colleges and universities (1,140 workers). No other industry has employment of more than 1,000 in this occupation. High employment does not always translate into high pay, however, given that colleges and universities have one of the lowest average wages for this occupation out of all industries, at \$23.22 per hour. Scientific research and development services have a much higher mean wage of \$37.34 per hour, while of the three industries, the highest average wage is found in pharmaceutical and medicine manufacturing, with an hourly mean of \$39.06. This may reflect the high potential profit levels in this industry, which have been shown to be correlated with high wages.²

Scientific research and development services, colleges and universities, and pharmaceutical and medicine manufacturing are also the three largest employers of medical scientists, except epidemiologists, reflecting the research orientation of these industries. Occupational employment is 21,600 in scientific research and development services, 20,290 in colleges and universities, and 10,350 in pharmaceutical and medicine manufacturing. There are six other industries that have an employment of greater than 1,000 in this occupation. Mean hourly wages for medical scientists, except epidemiologists, show considerable inter-industry variation, ranging from \$26 to \$48. Hourly means for the leading three industries are \$36.15 (scientific research and development services), \$26.04

(colleges and universities), and \$39.06 (pharmaceutical and medicine manufacturing). As with biochemists and biophysicists, higher wages appear to be correlated with higher profits, while colleges and universities rank last in terms of wages among the 25 industries employing this occupation.

Physicists are primarily employed in three industries: scientific research and development services (5,320), federal government (3,210), and colleges and universities (2,030). No other 4-digit NAICS industry has employment over 1,000 for this occupation. The average hourly wages for the leading three industries are \$44.18 (scientific research and development services), \$48.69 (federal government), and \$31.35 (colleges and universities).

The leading three industries for chemists are similar to other scientists, however they may be found in a greater number of 4-digit NAICS industries than all other life and physical science occupations. The leading three industries in employment are pharmaceutical and medicine manufacturing (12,920), scientific research and development services (12,890), and architectural and engineering services (9,890). These industries account for less than 47 percent of employment in this occupation. The average hourly wages for the leading three industries are \$29.93 (pharmaceutical and medicine manufacturing), \$34.14 (scientific research and development services), and \$24.80 (architectural and engineering services). One of the highest paid industries for chemists is the federal government, which employs 5,560 workers with an average hourly wage of \$41.29.

State Employment and Wage Estimates

Employment and wages for life and physical scientists vary considerably across states. States with the highest shares of employment in life science occupations include Alaska, Maryland, the District of Columbia, Montana, Idaho, Washington, and Wyoming. States with the highest concentrations of physical scientists include New Mexico, the District of Columbia, Delaware, Alaska, Wyoming, Colorado, and Maryland. The employment can largely be explained by looking at the shares of the science specialties in each state. For example, Delaware has the highest concentration of chemists, and Alaska has the highest concentration of environmental scientists. Tables 9 through 12 show state-level employment and wage information for the 2 largest life and physical science occupations. Wages for environmental scientists and specialists, including health, range from \$18.91 in Mississippi to nearly \$39 in the District of Columbia. California, with an employment of 8,970, is the state with the highest employment for this occupation. However, relative to total state employment it is the less populated states that have a larger share of employment, with Alaska, the District of Columbia, Montana, and Washington having the highest employment shares in this occupation.

Average wages for chemists range from \$20.47 in South Dakota to \$38.77 in Maryland. The states with the highest

¹ U.S. Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2006-07 Edition*, Environmental Scientists and Hydrologists, on the Internet at <http://www.bls.gov/oco/ocos050.htm> (visited September 05, 2006).

² "The Fortune 500," *Fortune*, April 15, 2002, p. F.26.

paid chemists, including Maryland, the District of Columbia, Indiana, Massachusetts, and Delaware are also among the states with the highest concentration of this occupation.

California, New York, Massachusetts, and North Carolina have the highest employment of biochemists and biophysicists, while Connecticut, Massachusetts and New Jersey have the highest concentrations. Average hourly wages vary from \$20.63 in Louisiana to \$50.42 in Indiana.

Finally, medical scientists, except epidemiologists, have a state average hourly wage range of \$20.45 in Mississippi to \$46.91 in Nevada; of the highest-paying states, New Jersey is the largest employer, with 3,680 workers.

It is interesting to note that the District of Columbia has one of the highest employment concentrations for each of the four occupations listed. Another interesting finding is that Alaska is ranked first in percent employment for environmental scientists and specialists, including health, although it is not among the states with the highest concentrations of the other occupations. This is due to strong employment of

this occupation by federal, state, and local governments in Alaska.

Conclusion

In summary, the life and physical science occupations are generally higher paid than the average of all occupations, due to the education and skill required to work in these professions. All of the occupations have employment in government with some having the majority of their respective employment from government. For other occupations, the dominant employers were scientific research and development services, colleges and universities, and pharmaceutical and medicine manufacturing, reflecting the focus of these industries and occupations on innovation and research. The geographic distribution of employment for these occupations is determined by the industries that employ them. For more information about other occupations in the life and physical sciences, please visit the OES homepage at <http://www.bls.gov/oes/home.htm>.

Table 1. National Employment and Wages for the Life and Physical Sciences

Occupation	Employment	Average hourly wage
Life Scientists		
Medical scientists, except epidemiologists.....	73,670	\$33.24
Biological scientists, all other	26,200	30.61
Biochemists and biophysicists	17,690	36.21
Zoologists and wildlife biologists	16,440	26.58
Conservation scientists	15,540	26.27
Microbiologists	15,250	30.46
Life scientists, all other.....	12,790	31.04
Foresters	10,750	24.53
Soil and plant scientists.....	10,100	27.90
Food scientists and technologists	7,570	27.33
Epidemiologists	3,630	27.09
Animal scientists	3,000	22.88
Physical Scientists		
Chemists	76,540	30.51
Environmental scientists and specialists, including health.....	72,000	27.63
Geoscientists, except hydrologists and geographers.....	27,430	38.46
Physical scientists, all other	23,800	40.57
Physicists	15,160	43.98
Hydrologists	8,360	32.33
Materials scientists.....	7,880	35.74
Atmospheric and space scientists.....	7,050	35.11
Astronomers.....	970	48.73

Table 2. **Employment by Industry for the Life and Physical Science Groups**

Industry	Employment
Life Scientists	
Scientific research and development services	45,530
Federal government.....	37,200
Colleges and universities	32,530
Pharmaceutical and medicine manufacturing	21,480
State government.....	18,330
General medical and surgical hospitals	8,610
Local government.....	6,950
Management and technical consulting services.....	4,540
Management of companies and enterprises	3,300
Architectural and engineering services	3,270
Physical Scientists	
Scientific research and development services	32,220
Architectural and engineering services	31,890
Federal government.....	28,900
State government.....	26,680
Management and technical consulting services.....	22,550
Pharmaceutical and medicine manufacturing	14,480
Local government.....	13,030
Colleges and universities	12,750
Oil and gas extraction	6,000

Table 3. **Scientific research and development services, Life and Physical Science Occupations by Employment**

Occupation	Employment	Average hourly wage
Medical scientists, except epidemiologists	21,600	\$36.15
Chemists	12,890	34.14
Biochemists and biophysicists	8,110	37.34
Physical scientists, all other	6,360	45.45
Physicists	5,320	44.18
Microbiologists	4,130	32.53
Zoologists and wildlife biologists	3,040	28.46
Biological scientists, all other	2,860	32.45
Life scientists, all other.....	2,810	35.83
Environmental scientists and specialists, including health.....	2,800	32.45
Materials scientists.....	2,680	36.55
Soil and plant scientists	1,360	27.45
Atmospheric and space scientists.....	1,240	37.44
Food scientists and technologists	930	32.75
Geoscientists, except hydrologists and geographers	590	33.75
Epidemiologists	290	36.57
Conservation scientists	200	29.75
Animal scientists	190	26.46

Table 4. Federal government (OES designation), Life and Physical Science Occupations by Employment

Occupation	Employment	Average hourly wage
Biological scientists, all other.....	15,760	\$32.00
Conservation scientists.....	7,630	29.66
Physical scientists, all other.....	6,930	43.73
Chemists.....	5,560	41.29
Environmental scientists and specialists, including health	5,170	36.62
Zoologists and wildlife biologists	4,100	33.03
Physicists.....	3,210	48.69
Atmospheric and space scientists	2,660	38.78
Geoscientists, except hydrologists and geographers.....	2,630	41.40
Soil and plant scientists.....	2,510	33.75
Foresters	2,410	29.80
Hydrologists.....	2,250	36.08
Microbiologists.....	2,210	39.96
Medical scientists, except epidemiologists.....	2,040	45.99
Astronomers	420	55.43
Biochemists and biophysicists.....	400	41.11
Food scientists and technologists.....	150	39.28
Materials scientists	80	51.61

Table 5. Colleges and Universities, Life and Physical Science Occupations by Employment

Occupation	Employment	Average hourly wage
Medical scientists, except epidemiologists.....	20,290	\$26.04
Environmental scientists and specialists, including health	3,500	22.35
Physical scientists, all other.....	2,990	28.31
Biological scientists, all other.....	2,650	21.95
Animal scientists.....	2,150	20.97
Life scientists, all other	2,120	25.48
Physicists.....	2,030	31.35
Chemists.....	1,820	21.86
Soil and plant scientists	1,510	24.70
Biochemists and biophysicists.....	1,140	23.22
Geoscientists, except hydrologists and geographers.....	1,140	28.26
Microbiologists.....	1,030	23.77
Zoologists and wildlife biologists	600	23.11
Atmospheric and space scientists	480	31.13
Materials scientists	440	25.79
Food scientists and technologists.....	370	24.05
Epidemiologists	320	24.07
Astronomers	290	40.30
Conservation scientists.....	180	23.49
Hydrologists.....	60	27.39

Table 6. State government (OES designation), Life and Physical Science Occupations by Employment

Occupation	Employment	Average hourly wage
Environmental scientists and specialists, including health	18,300	\$23.69
Zoologists and wildlife biologists	5,930	22.45
Foresters	2,980	21.50
Conservation scientists.....	2,930	23.72
Geoscientists, except hydrologists and geographers.....	2,630	24.67
Chemists.....	2,170	23.05
Physical scientists, all other.....	1,650	32.15
Life scientists, all other	1,430	27.83
Hydrologists.....	1,400	25.09
Microbiologists.....	1,370	21.93
Epidemiologists	1,320	24.24
Biological scientists, all other.....	740	25.56
Medical scientists, except epidemiologists.....	600	26.65
Soil and plant scientists.....	430	24.73
Biochemists and biophysicists.....	300	20.68
Physicists.....	280	28.04
Food scientists and technologists.....	160	23.68
Animal scientists.....	130	27.23

Table 7. Pharmaceutical and Medicine Manufacturing, Life and Physical Science Occupations by Employment

Occupation	Employment	Average hourly wage
Chemists.....	12,920	\$29.93
Medical scientists, except epidemiologists.....	10,350	39.06
Biochemists and biophysicists.....	4,260	39.06
Microbiologists.....	3,390	29.59
Biological scientists, all other.....	1,700	32.88
Life scientists, all other	1,680	36.74
Materials scientists	950	31.78
Physical scientists, all other.....	140	31.81
Environmental scientists and specialists, including health	110	36.49
Food scientists and technologists.....	40	21.61

Table 8. Local government (OES designation), Life and Physical Science Occupations by Employment

Occupation	Employment	Average hourly wage
Environmental scientists and specialists, including health	10,230	\$25.35
Conservation scientists.....	2,760	20.21
Chemists.....	1,880	26.43
Foresters	1,110	23.36
Epidemiologists	870	24.93
Hydrologists.....	520	30.52
Soil and plant scientists.....	510	22.72
Microbiologists.....	500	27.14
Zoologists and wildlife biologists	340	25.27
Medical scientists, except epidemiologists	310	35.38
Biological scientists, all other.....	240	27.32
Physical scientists, all other.....	240	29.00
Life scientists, all other	190	24.16
Geoscientists, except hydrologists and geographers.....	110	29.86
Animal scientists.....	60	22.14
Food scientists and technologists.....	50	22.54
Physicists.....	40	27.99
Biochemists and biophysicists.....	30	32.18

Table 9. Environmental Scientists and Specialists, including Health by State Percent Employment

State	Average hourly wage	Annual mean wage	Employment	Percent employment
Alaska.....	\$28.19	\$58,630	630	0.210
District of Columbia	38.81	80,730	1,210	0.199
Montana.....	20.10	41,810	630	0.152
Washington.....	30.20	62,810	3,330	0.125
Idaho.....	27.02	56,210	700	0.118
Maine.....	22.51	46,820	600	0.101
Hawaii.....	26.52	55,150	560	0.095
Vermont.....	25.42	52,870	270	0.092
Virginia.....	31.90	66,360	3,160	0.089
Wyoming.....	22.84	47,510	220	0.088
Massachusetts.....	34.72	72,210	2,360	0.075
Colorado.....	33.29	69,230	1,560	0.073
California	31.39	65,290	8,970	0.06
Nevada	34.28	71,310	520	0.044
National	27.63	57,470	72,000	1.000

Table 10. Chemists by State Percent Employment

State	Average hourly wage	Annual mean wage	Employment	Percent employment
Delaware	\$35.15	\$73,120	1,360	0.327
New Jersey.....	31.49	65,490	4,970	0.127
Maryland.....	38.77	80,640	3,140	0.126
Maryland.....	38.77	80,640	3,140	0.126
Massachusetts.....	35.17	73,160	2,850	0.091
District of Columbia	37.03	77,020	540	0.089
Indiana.....	36.46	75,840	2,410	0.083
National	30.51	63,470	76,540	1.000

Table 11. Biochemists and Biophysicists by State Percent Employment

State	Average hourly wage	Annual mean wage	Employment	Percent employment
Connecticut.....	\$44.37	\$92,290	830	0.050
Massachusetts.....	44.15	91,840	1,520	0.048
New Jersey.....	40.16	83,520	1,140	0.029
District of Columbia	27.19	56,560	140	0.023
California	36.72	76,380	3,390	0.023
Indiana.....	50.42	104,870	660	0.023
National	36.21	75,320	17,690	1.000

*does not include non-releasable states

Table 12. Medical Scientists, except Epidemiologists by State Percent Employment

State	Average hourly wage	Annual mean wage	Employment	Percent employment
Massachusetts.....	\$35.93	\$74,740	4,800	0.153
District of Columbia	34.47	71,690	880	0.144
Connecticut.....	39.77	82,710	2,270	0.138
Washington.....	33.45	69,580	3,300	0.124
Pennsylvania	31.58	65,680	6,480	0.116
Maryland.....	35.37	73,560	2,820	0.113
California	36.02	74,920	15,470	0.105
New Jersey.....	40.08	83,370	3,680	0.094
Oklahoma	21.70	45,140	1,170	0.080
Missouri	28.80	59,910	1,940	0.073
National	33.24	69,140	73,670	1.000

*does not include non-releasable states