Salaries 2004

Analysis of the American Chemical Society's 2004 Comprehensive Salary and Employment Status Survey.

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Contents

Acknowledgements

This report presents detailed results of the 2004 ACS Comprehensive Salary and Employment Status Survey. Summaries of the survey findings were published in the August 16, 2004 issue of *Chemical & Engineering News* and the September 2004 issue of *Today's Chemist at Work*.

The ACS Council Committee on Economic and Professional Affairs, chaired by Marinda Li Wu, and its Subcommittee on Surveys, chaired by H.N Cheng, planned and provided general oversight of the survey and its analysis in 2004. The committee is grateful to the more than 11,600 members who provided a valuable service to the profession by completing the survey questionnaire.

Mary Jordan, Workforce Specialist, conducted this year's survey and produced the data tables. Richard Ellis, Ellis Research Services, wrote the following summary. Blake Stenning, Pittny Creative, designed this report.

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Summary and Comments

Salaries

FOR THREE YEARS IN A ROW, RESULTS FROM THE ANNUAL ACS Comprehensive Salary and Employment Status Survey have adhered to a common general pattern: in 2004 as in 2003 and 2002, compensation scales have held up for chemists who have full-time positions in industry, government, or academia, while rates of unemployment for those in the profession have risen to well over three percent, compared to the generally lower levels of unemployment for chemical scientists that were typical of most years since these studies began in 1972.

ALL CHEMISTS The overall median annual salary for the chemists who participated in the 2003 survey was $82,000, 2.5 percent higher than the $80,000 result for 2002. Most of the increase was needed just to adjust salary scales for the effects of inflation, and actual increases in the purchasing power of chemical salaries was much smaller, just 0.8 percent.[1] Broken apart by levels of the highest earned degree, in 2004 the largest increases went to those with a bachelor's; those with advanced degrees did not do as well (see Table 1). The opposite result was obtained in 2003, when those with master's and doctoral degrees did significantly better than chemists whose highest degree was a B.S. Often repeated surveys of the salaries of technical professionals suggest efforts on the part of compensation managers to balance changes in remuneration, and if a group of employees gets particularly substantial increases in one year, it's not unusual for different groups of people to get compensating improvements in a subsequent year. Such balancing is one of the reasons why the last three years seem to represent a generally consistent picture. These results measure the compensation levels typical of the chemical science profession as a whole, and do not allow for the raises reflecting an additional year of experience that were received by many individuals.

TABLE 1. CHANGE IN ALL CHEMISTS SALARIES, 2003–2004

Degree	Median Salary 2004 (2003)	%Change from 2003 (current dollars)	(constant dollars)
TOTAL	$82,000 (80,000)	UP 2.5	UP 0.8
BACHELOR'S	$62,000 (59,700)	UP 3.9	UP 2.2
MASTER'S	$72,300 (71,300)	UP 1.4	DOWN 0.3
DOCTORATE	$91,600 (90,000)	UP 1.8	UP 0.1

[1] The most widely used measure of inflation, the U.S. Consumer Price Index for Urban Areas (CPI-U), increased from 184.2 to 187.4, or 1.7 percent, between March, 2003 and March, 2004.

INDUSTRIAL/ PRIVATE SECTOR CHEMISTS

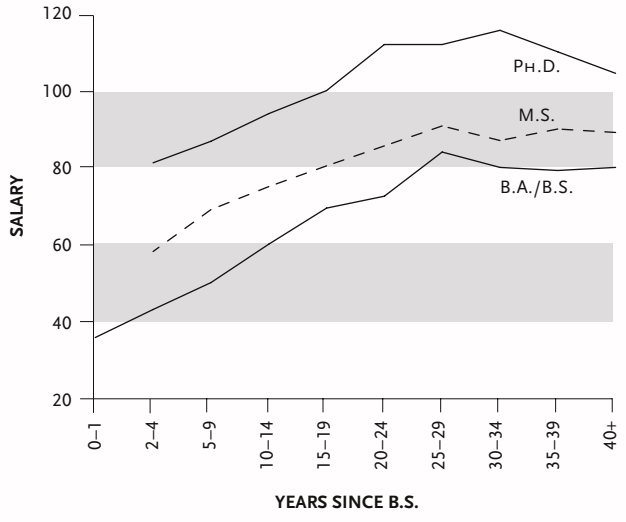
As in the past, the best pay scales for chemists are found in the private sector, especially in manufacturing. Private sector results for 2004 are roughly similar to those for all chemists (see Table 2). Healthy increases of 5.0 percent were realized in the pay scales for those whose highest degree was a bachelor's degree; in 2003, median salaries for the same group failed to keep pace with increased inflation. Chemists with doctoral degrees were able to keep up with the rise in the cost of living, but those with master's degrees reported an absolute decline in median salaries, from $76,500 in 2003 to $76,000 in 2004, and so the purchasing power of those salaries also declined.

TABLE 2. CHANGE IN INDUSTRIAL/PRIVATE SECTOR CHEMISTS' SALARIES, 2003–2004

Degree	Median Salary 2004 (2003)	%Change from 2003 (current dollars)	(constant dollars)
Bachelor's	$63,000 (60,000)	up 5.0	up 3.3
Master's	$76,000 (76,500)	down 0.7	down 2.4
Doctorate	$100,000 (98,000)	up 2.0	up 0.3

Figure 1 displays the traditional "maturity curves," commonly used by many compensation analysts, for 2004 salaries of chemists in industry by level of highest earned degrees. As typical for such private sector data,[2]

FIGURE 1. 2004 INDUSTRIAL CHEMISTS' SALARIES BY YEARS SINCE B.S. AND DEGREE



[2] At first glance, salary data for academics might also appear to fit the maturity curve models, but when data for those practitioners are examined by professorial ranks, it can be seen that this interpretation is misleading. Within ranks, academic compensation is relatively flat, and increases in pay are tied to promotions to assistant, associate, and full professorships, rather than to years of service as such.

rapid gains in pay scales occur during the earliest years of service, followed by a flattening out of salaries for mature practitioners, for whom the impact of another year of experience has become less critical. At the most senior levels, salary scales can tail off as each cohort of chemists loses some of its more highly-paid people to retirement. The general shape of these curves has not changed greatly in 2004, although levels of pay for each group of degreed chemists have shifted in accordance with the general changes in compensation scales described above.

ACADEMIC CHEMISTS

Salary scales for academic chemists present a less consistent picture (see Table 3). In 2003, only the set of assistant professors on 11–12 month contracts saw real improvements in the buying power of their salaries; all other groups failed to keep up with inflation. The same group of assistant professors, along with the set of associate professors with similar 11–12 month contracts, also did relatively well in 2004; these people are likely to be holding research appointments. Increases in salaries also exceeded the rise in the cost of living for full professors on 9–10 month contracts. All other groups continued to lose ground, especially associate professors on 9-10 month contracts, who reported substantially lower absolute salaries in 2004 than they did in 2003 ($48,600, compared to $55,000 the previous year). Relatively small numbers of cases for some of these groups may contribute to the volatility of these results.

TABLE 3. CHANGE IN PH.D. ACADEMIC CHEMISTS' SALARIES, 2003–2004

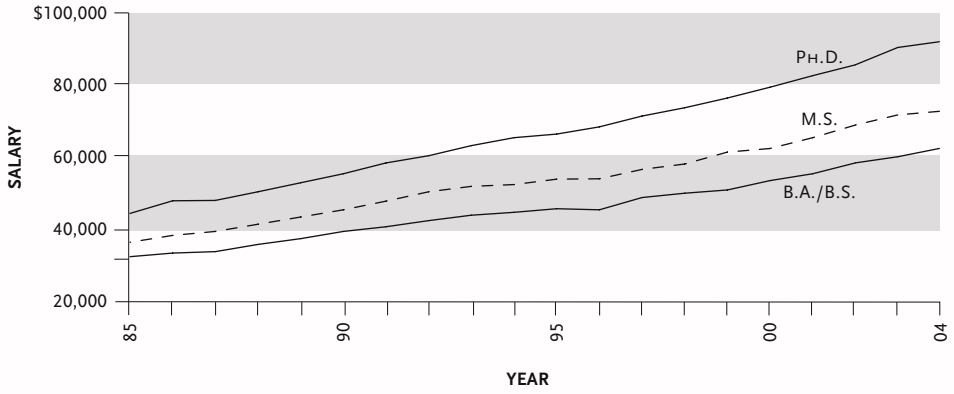
Rank/ Contract	Median Salary 2004 (2003)	% Change from 2003 (current dollars)	(constant dollars)
Full 9/10	$83,000 (81,000)	up 2.5	up 0.8
Full 11/12	$110,000 (111,400)	down 1.3	down 3.0
Assoc 9/10	$48,600 (55,000)	down 11.6	down 13.3
Assoc 11/12	$80,000 (75,000)	up 6.7	up 5.0
Asst 9/10	$48,200 (48,200)	no change	down 1.7
Asst 11/12	$64,000 (61,000)	up 4.9	up 3.2

TRENDS IN CHEMISTS' SALARIES

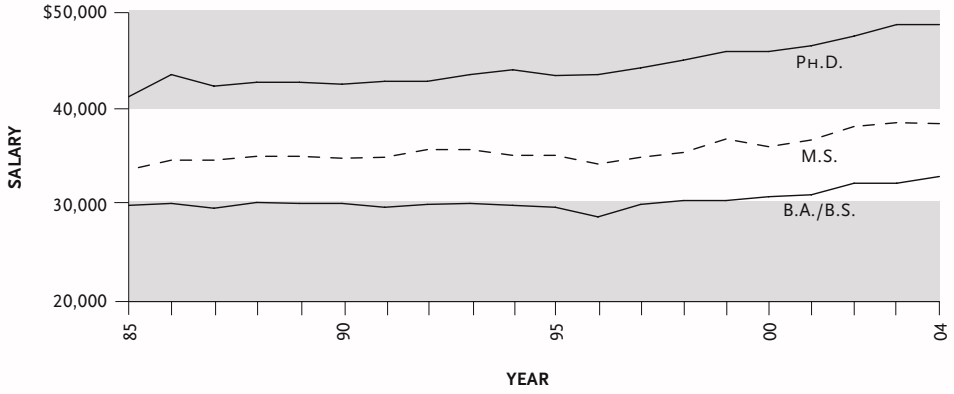
Figure 2 presents graphed results of these surveys from 1985 to the present for both absolute and constant dollars. The latter numbers adjust for changes in the U.S. Consumer Price Index for Urban Areas (CPI-U) and are a more accurate reflection of changes in the real purchasing power of chemists' salaries. Except for improvements for persons whose highest degree was a bachelor's, constant dollar salary scales in 2004 were virtually identical to those in 2003.

FIGURE 2. CHEMISTS' MEDIAN SALARIES IN CURRENT AND CONSTANT DOLLARS

(IN CURRENT YEAR DOLLARS)



(IN CONSTANT 1984 DOLLARS)



Non-Salary Income

Examination of the total compensation of technical professionals has been complicated with the addition of various types of bonuses, stock options, profit sharing plans, consulting fees, and other kinds of earned income or benefits to base salaries. Most of the respondents to ACS's annual salary surveys receive one or more of these additional kinds of remuneration. These data are for preceeding calendar years; for example, the 2004 survey collects information about consulting income, bonuses, and stock options in calendar 2003.

CONSULTING

ACS' 2003 salary survey recorded both a small rise in the proportion of respondents who reported earnings from consulting assignments and increases in typical consulting rates, but both changes were reversed in 2004, with the proportion doing consulting falling back to 9.9 percent and all of the rises in hourly rates reverting back to the levels reported two years ago in 2002 (see Table 4). Income from consulting improved slightly, rising to a median level of $700 for those who had such income, but this improvement is still well short of the $1,000 median levels recorded in 2002. As in the 2003 survey, chemists with a bachelor's degree and earnings from consulting had the best improvements in incomes from this source. Those with master's degrees also improved. There was a slight gain for holders of doctoral degrees, from $500 to $550, but this does not begin to make up for the losses these chemists reported in the 2003 survey, when their median consulting earnings were reduced by half. As in other ACS salary surveys, academic chemists and those employed outside manfacturing were the most likely to have earnings from consulting in 2004. Men were more likely to do consulting than women; in 2003, ACS respondents reported increasing differences between men and women in consulting rates. Some of this gap was reduced in the 2004 results, which yielded fees of $125 per hour for men and $100 per hour for women. Also as in the past, increased professional experience is strongly associated with doing consulting, having higher consulting rates, and thus having higher levels of consulting income.

TABLE 4. CONSULTING DONE IN 2003

	% Consult	Hourly Rate	Median Income
All chemists	9.9%	$100	$700
Degree			
B.S.	4.1%	$100	$1,700
M.S.	6.8%	$90	$1,610
Ph.D.	12.6%	$125	$550
Employer			
Industry–mfg.	4.0%	$100	$720
Industry–non mfg.	12.4%	$100	$1,800
Government	5.7%	$80	$750
College or univ.	19.4%	$125	$500
Sex			
Men	11.2%	$125	$775
Women	5.9%	$100	$430
Age			
20–29	2.3%	$50	$260
30–39	4.9%	$100	$660
40–49	9.1%	$100	$500
50–59	12.3%	$125	$700
60–69	19.2%	$125	$1,000

Note: This year's respondents asked for previous year's consulting.

BONUSES Apart from an improvement in the median level of earnings from bonuses, results in the 2004 survey for this kind of income were nearly identical to those reported in 2003 (see Table 5). Half of the chemists responding to the survey were eligible for bonuses, and 90 percent of those eligible for bonuses received them. The median total bonus income for all those receiving any earnings of this kind was $6,000, a rise from the $5,240 median reported by ACS respondents in 2003. Chemists with doctoral degrees were slightly less likely to be eligible for bonuses than others, but got the largest awards when they were eligible. Those who worked for manufacturers were both more likely to be eligible and to receive larger awards when they were eligible. Male chemists were more apt to be eligible but slightly less apt to receive bonuses than women chemists. Men generally received higher bonuses than women. A small increase appeared in the share of chemists in government jobs who were eligible for bonuses, from 36.5 percent of the respondents in the 2003 survey to 42.3 percent of those in 2004, and a decline in the already small portion of eligible academic chemists, from 8.6 percent in 2003 to 4.3 percent in 2004.

TABLE 5. BONUSES RECEIVED IN 2003

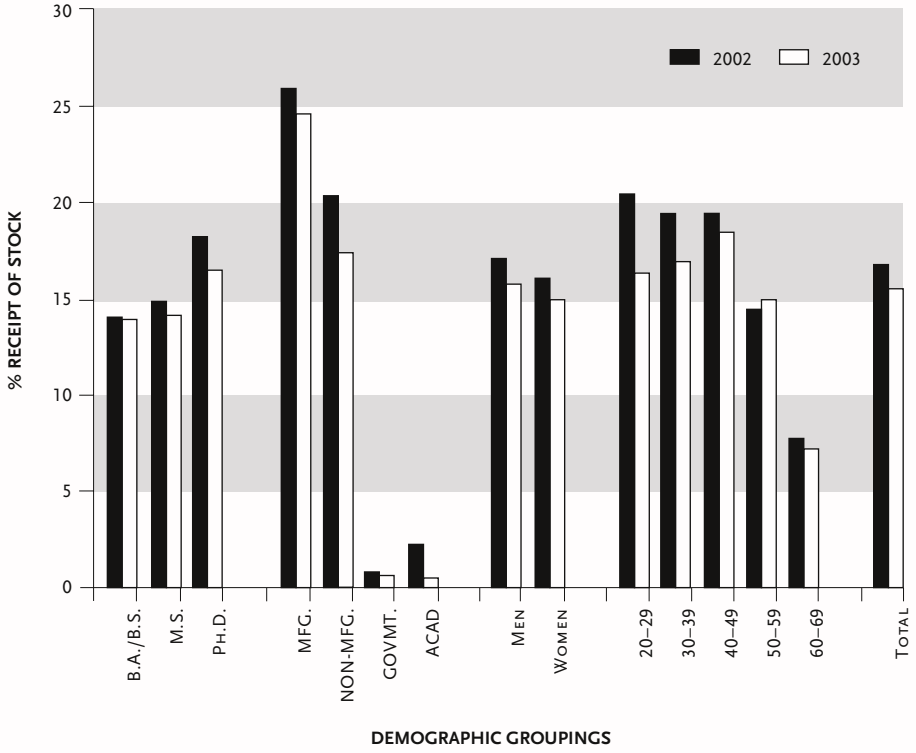
	% Eligible	% of Eligible Received	Median Bonus
All chemists	49.6%	90.1%	$6,000
Degree			
B.S.	54.5%	88.1%	$4,000
M.S.	56.5%	92.3%	$5,000
Ph.D.	46.1%	90.1%	$8,000
Employer			
Industry–mfg.	70.0%	91.9%	$7,000
Industry–non mfg.	53.4%	85.5%	$4,000
Government	42.3%	84.0%	$1,500
College or univ.	4.3%	83.6%	$2,000
Sex			
Men	51.6%	89.6%	$6,400
Women	44.2%	91.9%	$4,500
Age			
20–29	40.3%	89.7%	$2,000
30–39	51.7%	90.7%	$4,500
40–49	55.2%	90.5%	$6,800
50–59	50.3%	89.6%	$8,200
60–69	35.0%	88.9%	$6,200

Note: This year's respondents asked for previous year's consulting.

STOCK AS PART OF PROFESSIONAL INCOME

In 2001, ACS began to ask its salary survey respondents if they receive stock as a part of their compensation. Results for this question have been virtually identical for the past three surveys; a slight but persistent decline in the use of stock options is evident if the data are examined in detail. In the 2002 survey, 17.1 percent of the respondents reported offers of stock; in 2003, the result for this question was 16.5 percent; in 2004, it was 15.3 percent. Most of the more detailed breakdowns of this statistic show similar small reductions over the three survey years. In 2004, the use of stock as part of compensation is reported by 24.2 percent of the chemists in private manufacturing industries and 17.1 percent of those employed by private non-manufacturing employers. Small numbers of academic and government chemists also report receiving stock. Those with Ph.D degrees are slightly more likely to receive stock (16.2 percent) than others (see Figure 3).[3]

FIGURE 3. RECEIPT OF STOCK AS PART OF PROFESSIONAL INCOME FOR CHEMISTS RECEIVED IN 2002 & 2003



Note: This year's respondents asked for previous year's receipt of stock.

[3] Attention to stock options is still uncommon in studies of the compensation of technical professionals, but one other survey that does look at this kind of remuneration is the one done annually by IEEE-USA, the U.S. branch of the international Institute of Electrical and Electronics Engineers. Unlike the ACS survey, IEEE-USA asks its respondents to estimate the value of options received in the previous calendar year. Many of those receiving options state that this estimated value is zero, that is, the cost of executing options exceeds their expected market value. To be sure, some respondents report very substantial rewards of this type. But like ACS, only a minority of IEEE's respondents get any offers of stock at all.

Employment and Unemployment

EMPLOYMENT STATUS

In 2001, 91.8 percent of the salary survey respondents had full-time jobs. This percentage declined to 88.3 percent in 2002; to 87.9 percent in 2003; and to 86.7 percent in 2004. The 86.7 percent figure is the lowest proportion of full-time employment since ACS started keeping these figures in the early 1970s. The shares of those with part-time positions rose to 3.4 percent and those with postdoctoral appointments rose to 1.8 percent. See Table 6.

TABLE 6. EMPLOYMENT STATUS OF CHEMISTS, 1995–2004

(% by Year)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Full Time	88.8	89.4	90.5	89.8	89.4	88.7	91.8	88.3	87.9	86.7
Part Time	2.7	2.7	2.1	2.4	2.6	2.9	2.4	2.8	2.9	3.4
Post Doc	3.5	2.7	2.3	2.2	2	2	1.3	1.4	1.3	1.8
Not Employed										
Seeking	2.5	2.9	1.9	2.3	2.2	2.9	1.5	3.1	3.3	3.4
Not Seeking	2.6	2.3	0.8	0.9	1.3	1.7	1.4	1.5	1.7	1.4
Fully Retired			2.3	2.4	2.5	2.8	1.6	2.8	2.9	3.2
Overall* Unemployed**	2.6	3.0	2.0	2.3	2.3	2.0	1.5	3.3	3.5	3.6

*Retirement status was added in 1997.

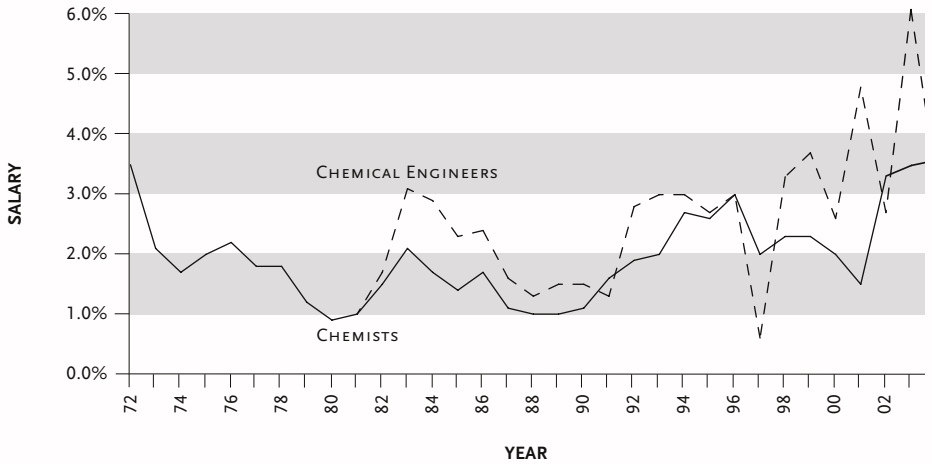
**Unemployment rate measures a status of the active workforce. Thus, "not seeking" and "fully retired" populations are dropped from the calculation of the unemployment rate.

UNEMPLOYMENT TRENDS

Unemployment among the chemical scientists surveyed by ACS remained at historically high levels in 2004 (see Figure 4). Although the unusually high level of joblessness reported for chemical engineers in the 2003 survey (6.1 percent) fell back substantially, rates of joblessness for chemists rose to an historical high of 3.6 percent.

Although most of the attention on recent levels of unemployment for chemists has focused on the last three years, there is some evidence that the rise in joblessness for the profession may have begun significantly earlier. In ACS' original 1972 salary survey, done during the worst of the so-called "aerospace recession," 3.5 percent of the chemists who participated in the study reported being out of work. This proportion then dropped to 2.1 percent in 1973, and never exceeded that figure again—indeed, in most years, it was considerably lower than this—until 1994 (higher rates were occasionally recorded for the separate group of chemical engineers in those years, but not for the much larger set of chemical scientists). In 1994, the unemployment level for chemists in the ACS salary survey jumped to 2.7 percent. By 1996, it reached 3.0 percent. It then dropped back again, reaching a new low point in 2001 of just 1.5 percent, and this helps to explain why outcomes in 2002 were such a shock: levels of unemployment more than doubled. Even so, it is possible that the break in 1994 was just as significant; that year marked the end of a lower level of joblessness that had lasted for more than twenty years.

FIGURE 4. UNEMPLOYMENT RATES FOR CHEMISTS AND CHEMICAL ENGINEERS, 1972–2003



Technical Notes

THE SAMPLE

The target population of the 2004 ACS Comprehensive Salary and Employment Status Survey is ACS regular members under the age of 70 who have U.S. mailing addresses and have neither student, retired, nor emeritus membership status. This year, a general sample was drawn from a database consisting of all members meeting the above criteria. A notification postcard with the web address of the survey was mailed to 22,500 members during the last week on February 2004. The printed survey questionnaires, along with the web directions, were mailed to members by first-class mail during the first week of March 2004. The third mailing consisted of a reminder postcard mailed about a week after the first printed mailing. A follow-up fourth, another full mailing consisting of the survey questionnaire, was sent to non-respondents during the week of April 16, 2004.

After the May 15th cut-off date an error in sampling, omitting the western states, was discovered. Another 7500 surveys were mailed, based on the expected response rate for a single full mailing with a postcard reminder and the number of members in the missing geographic area, another full mailing and postcard mailed in June with a mid-July cutoff. Ultimately, 30,000 surveys mailed and about 11,600 useable surveys were returned for a response rate of 39 percent. The final geographic distribution of the respondents agreed with the distribution of the target population.

DEFINITIONS

For the purposes of the survey analysis, the following definitions were used:

Chemist: A respondent who indicated a work specialty of chemistry or biochemistry (categories 2 through 16 of Part 1, Question 3 of the questionnaire) or, if a non-chemistry work specialty (categories 17 through 20 of the same question), a degree field of chemistry or biochemistry.

Chemical Engineer: A respondent who indicated a work specialty of chemical engineering (category 1 of Part 1, Question 3 of the questionnaire).

Nonchemist: A respondent whose work specialty category is other than chemistry or chemical engineering, or if non-chemistry work specialty, no degree field of chemistry or biochemistry.

Academic: Pertaining to Ph.D.s working in a college or university, i.e., a private or public institution that awards a degree of associate or higher.

Unemployed: A respondent who was not employed and was seeking employment (category 4 of Part 1, Question 4 of the questionnaire). The unemployment rate calculated to compare with the national rate drops those “not seeking” or “fully retired” from the labor force.

Respondents indicated their employment status, base annual salaries, and ages as of March 1, 2004. The respondent's place of employment (current or most recent) determines geographic region. The listing of states by geographic regions follows this section.

DISCREPANCIES AMONG TABLES

Some pairs of tables contain totals that should be identical but are not. For example, two tables that represent information about Ph.D. respondents should show the same total number of PhDs. However, they might show different totals. This phenomenon is generally caused by missing response items in a survey. Not every respondent answers all questions all of the time. To illustrate, if one table groups the Ph.D.s according to specialty and another groups them according to work function, the totals will differ unless the number who did not indicate their specialty is the same number (or person even) that did not indicate their work function.

COMPARING SALARIES

Questions arise frequently about salary comparisons, such as between degrees of men and women. All such comparisons require caution. The salaries here represent the medians and means of ACS members. Most of the statistics in this report are descriptive in nature, not analytical.

Tests of significance should be performed on any salary discrepancies to see whether the observed salary differences between groups are mere chance resulting from some peculiarity of the sample itself. The significance of a difference between subpopulations depends on multiple factors. These factors include, among other things, the magnitude of the difference within the sample and between sample groups, and sample size.

NONRESPONSE BIAS

One source of sample error may arise from a response bias. Members who respond may be different than members who do not respond. Past comparisons of ACS membership records showed no bias in terms of age, sex, employer, or geographic region. In addition, a telephone follow-up of 388 nonrespondents to the 1991 survey showed the nonrespondents salaries were virtually the same as the respondents. The mean salary for the respondents was $57,007; for nonrespondents it was $57,982. A t-test of the difference between the mean salaries of the two groups resulted in no significant difference between the means. Student's t[4] was only 0.57 between the two groups. The percent in both groups that were unemployed was also the same – 1.6%.

4 Student's t, or the distribution of t, is a test statistic that evaluates the randomness of a given distribution. In this case, the sample of the nonrespondents vs. responders of the 1991 Comprehensive Survey was tested with the Student's t of .057 showing very closely aligned groups.

List of Possible Abbreviations for Tables

	Abbreviation	Degree
DEGREES	B.A.	Bachelor of Arts
	B.S.	Bachelor of Science or all bachelor's degrees
	M.S.	Master of Sciences
	Ph.D.	Doctor of Philosophy
FIELDS OF DEGREE AND WORK SPECIALTIES	Chem eng	Chemical Engineering
	Ag chem	Agricultural/food chemistry
	Analyt chem	Analytical chemistry
	Biochem	Biochemistry
	Biotech	Biotechnology
	Chem ed	Chemical education
	Clinical chem	Clinical chemistry
	Environ chem	Environmental chemistry
	Gen chem	General Chemistry
	Inorg chem	Inorganic chemistry
	Material sci	Materials science
	Med/pharma	Medicinal/pharmaceutical chemistry
	Organic chem	Organic chemistry
	Physical chem	Physical chemistry
	Polymer chem	Polymer chemistry
	Other chem	Other chemical sciences
	Bus admin	Business administration
	Computer sci	Computer science
	Othr non-chem	Other non-chemistry

	Abbreviation	Region
REGIONS	Pacific	Pacific
	Mountain	Mountain
	WN Central	West North Central
	WS Central	West South Central
	EN Central	East North Central
	ES Central	East South Central
	Mid-Atlantic	Middle Atlantic
	So-Atlantic	South Atlantic
	New England	New England
	WN Central	West North Central

EMPLOYERS

Abbreviation	Employer
Mfg	**Manufacturing**
Aero/auto	Aerospace/auto/transportation
Ag chem	Agricultural chemicals
Basic chem	Basic commodity chemicals
Biochem prods	Biochemical products
Building mats	Building materials
Coating/ink	Coatings/ink/paints
Electronics	Electronics/computers/semiconductors
Food	—
Instruments	—
Med products	Medical devices/diagnostic products
Metals	Metals/minerals
Paper	—
Personal care	—
Petroleum	Petroleum/natural gas
Pharma prods	Pharmaceutical products
Plastics	—
Rubber	—
Soaps	Soaps/detergents/surfactants
Spec chem	Specialty/fine chemicals
Textiles	—
Othr mfg	Other manufacturing
Non-mfg	**Non-manufacturing**
Analyt lab	Analytical service/testing laboratory
Biotech resrch	Biotech research firm
Indep research	Independent or contract research firm
Hospital lab	Hospital or clinical laboratory
Non-profit	Non-profit organization
Private utility	Private utility company
Profl services	Professional services-scientific/engineering/law
Research inst	Research institution
Science temp	Scientific temporary or personnel agency
Othr non-mfg	Other non-manufacturing
Government	—
Federal	Federal (civilian)
Military	—
State or local	—
Othr govmt	Other Government
Self-employed	—

	Abbreviation	Employer
EMPLOYERS (CONT'D)	**Government**	—
	Federal	Federal (civilian)
	Military	—
	State or local	—
	Othr govmt	Other Government
	Self-employed	—
WORK FUNCTIONS	Analyt svcs	Analytical services, other than forensics
	Chem info	Chemical information services
	Computer	Computer programming, analysis, design
	Consulting	—
	Forensic	Forensic analysis
	Gen mgmt	General management or administration, other than R&D
	Health/safety	Health and safety/regulatory affairs
	Marketing	Marketing, sales, purchasing, technical service, economic evaluation
	Patents	Patents, licensing, trademarks
	Production QC	Production, quality control
	R&D-applied	R&D-Applied research, development, design
	R&D-basic	R&D-Basic research
	R&D-mgmt	R&D-Management or administration of R&D
	Training	Training or teaching
	Other	—

GEOGRAPHIC REGIONS

Pacific
- Alaska
- California
- Hawaii
- Oregon
- Washington

Mountain
- Arizona
- Colorado
- Idaho
- Montana
- Nevada
- New Mexico
- Utah
- Wyoming

West North Central
- Iowa
- Kansas
- Minnesota
- Missouri
- Nebraska
- North Dakota
- South Dakota

West South Central
- Arkansas
- Louisiana
- Oklahoma
- Texas

East North Central
- Illinois
- Indiana
- Michigan
- Ohio
- Wisconsin

East South Central
- Alabama
- Kentucky
- Mississippi
- Tennessee

Middle Atlantic
- New Jersey
- New York
- Pennsylvania

South Atlantic
- Delaware
- District of Columbia
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