

Salaries 2003

ANALYSIS OF THE AMERICAN CHEMICAL SOCIETY'S
2003 COMPREHENSIVE SALARY AND
EMPLOYMENT STATUS SURVEY.

American Chemical Society
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ACKNOWLEDGMENTS

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Acknowledgements

This report presents detailed results of the 2003 ACS Comprehensive Salary and Employment Status Survey. Summaries of the survey findings were published in the August 4, 2003 issue of *Chemical & Engineering News* and the September 2003 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 2003. The committee is grateful to the nearly 9,500 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

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ATA FROM THE ACS 2003 COMPREHENSIVE salary and employment status survey reinforce trends reported in 2002: for members who held full-time positions in industry, government, or academia, salary scales held up, at least for those with advanced degrees, but levels of unemployment remained at their highest proportions since these annual studies began in 1972.

ALL CHEMISTS The overall median salary for chemists responding to the 2003 survey was \$80,000, up 4.4% from the \$76,610 level recorded in 2002. Much of this gain was absorbed by inflation, and when it is measured in constant dollars, the improvement in compensation scales shrinks to 1.4%. Chemists whose highest degree was a bachelor's did not do as well; their absolute gain of 2.9% was not large enough to overcome losses in buying power due to increases in the cost of living.¹ These are group results for all of the chemical scientists who participated in the survey; many individuals may have done better, receiving raises reflecting an additional year of experience.

INDUSTRIAL/ PRIVATE SECTOR CHEMISTS

As in the past, private sector pay scales for chemists, especially in manufacturing industries, fall on the higher end of the range, while chemists in non-manufacturing workplaces such as analytical laboratories tend to be paid less. 2003 Results for the private sector as a whole mirror those for all chemists, reported above: increases in pay scales for those with advanced degrees were about as good as in 2002, but improvements in compensation for those with a bachelor's degree were not large enough to keep up with inflation.

TABLE 1. CHANGE IN ALL CHEMISTS SALARIES, 2002–2003

Degree	Median Salary 2003 (2002)	%Change from 2002	
		(current dollars)	(constant dollars)
TOTAL	\$80,000 (76,600)	UP 4.4	UP 1.4
BACHELOR'S	\$59,700 (58,000)	UP 2.9	DOWN 0.1
MASTER'S	\$71,300 (68,500)	UP 4.1	UP 1.1
DOCTORATE	\$90,000 (85,200)	UP 5.6	UP 2.6

¹ The U.S. Consumer price index for urban areas (cpi-u), the most widely used measure of inflation, increased from 178.8 to 184.2, or 3.0 percent, between March, 2002 and March, 2003.

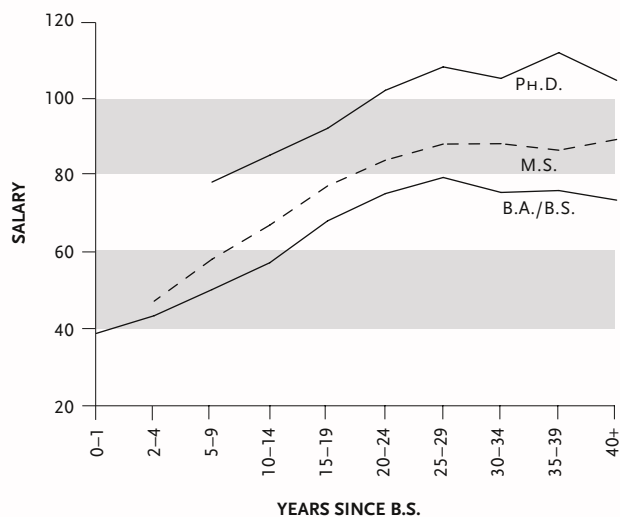
TABLE 2. CHANGE IN INDUSTRIAL/Private Sector Chemists' Salaries, 2002-2003

Degree	Median Salary 2003 (2002)	%Change from 2002 (current dollars)	(constant dollars)
BACHELOR'S	\$60,000 (59,000)	UP 1.7	DOWN 1.3
MASTER'S	\$76,500 (71,900)	UP 6.4	UP 3.4
DOCTORATE	\$98,000 (94,000)	UP 4.3	UP 1.3

Figure 1 provides traditional “maturity curves” for 2003 salaries of chemists in industry, by level of highest earned degrees. As is common for such data, rapid gains in pay scales occur during the earliest years of service. The scales then flatten out for mature practitioners, for whom the impact of another year of experience will have become less critical.

For the most senior people, salary scales tail off, because the composition of each cohort of chemists changes as its members grow older, and retirements of some of the more highly-paid people cause median levels of pay for the group of very experienced professionals to decline.

FIGURE 1. 2003 INDUSTRIAL CHEMISTS' SALARIES BY YEARS SINCE B.S. AND DEGREE



ACADEMIC CHEMISTS Salary scales for academic chemists failed to keep up with inflation in 2003. The only exception was the set of assistant professors on 11–12 month contracts, which are likely to be research appointments; median salaries for those chemists increased by 8.9%. Scales improved for other assistant professors on 9–10 month contracts and for full professors with either 9–10 or 11–12 month contracts, but in these cases the improvements were not quite large enough, on average, to match increases in costs of living. Scales for associate professors remained virtually identical to those recorded in 2002.

**TRENDS IN
CHEMISTS'
SALARIES**

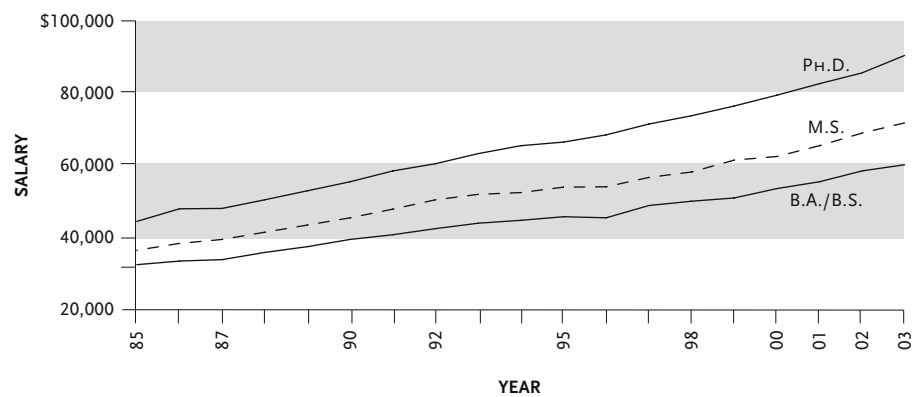
Results of these surveys from 1985 to the present are displayed in Figure 2. This year corrected values for the U.S. Consumer price index for urban areas (cpi-u) were used to plot trends; the corrections show that gains in the real purchasing power of chemists' salaries were somewhat overstated in the previous editions of this report. For those whose highest degree is a bachelor's, the constant dollar value of salary scales stayed remarkably consistent at around \$30,000 per annum in 1982–84 dollars until the final years of the

20th century, when an improvement began that has led to the current levels of \$32,410 (again, in 1982–84 dollars). For those with a master's degree, the buying power of salary scales has improved gradually over the entire period, from \$33,835 in 1985 to \$38,708 in 2003. And for those with doctoral degrees, a similar progression has raised purchasing power from \$41,353 to \$48,860 again, all of these constant values are stated in 1982–84 dollars.

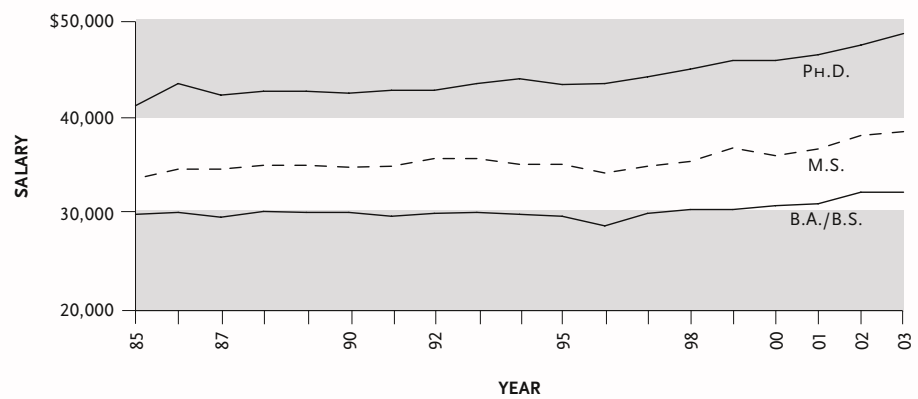
TABLE 3. CHANGE IN PH.D. ACADEMIC CHEMISTS' SALARIES, 2002–2003

Rank/ Contract	Median Salary 2002 (2001)	% Change from 2002	
		(current dollars)	(constant dollars)
FULL 9/10	\$81,000 (79,000)	UP 2.5	DOWN 0.5
FULL 11/12	\$111,400 (108,600)	UP 2.6	DOWN 0.4
ASSOC 9/10	\$55,000 (55,100)	DOWN 0.02	DOWN 3.2
ASSOC 11/12	\$75,000 (75,000)	NO CHANGE	DOWN 3.0
ASST 9/10	\$48,200 (47,000)	UP 2.5	DOWN 0.4
ASST 11/12	\$61,000 (56,000)	UP 8.9	UP 5.9

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



(IN CONSTANT 1984 DOLLARS)



Non-Salary Income

Assessing the total compensation of technical professionals has become increasingly complex, as base pay has become more and more likely to be augmented with different types of bonuses, stock options, profit sharing plans, consulting fees, and many other kinds of earned income or benefits. Most chemists obtain one or more of these additional kinds of compensation. Base salaries for March 1, 2003 and March 1, 2002 are asked in the survey. However, non-salary income is most often tallied for the entire prior year. Respondents are asked for their income, consulting, bonuses, and stock receipt for the prior year. This section shows the 2002 receipt of non-salary income as requested by the 2003 survey.

CONSULTING Despite both a small rise in the proportion of respondents who reported earnings from consulting assignments in 2002, to 10.2% from the 2001 level of 9.5%, and also increases in typical consulting rates from \$100 to

\$115 an hour, the median level of consulting income for all chemists in the 2003 survey declined again, falling from \$1,000 in 2001 to just \$600 in 2002. The drop was especially sharp for chemists with doctoral degrees, where median consulting earnings were reduced by half. Chemists with master's degrees managed to come fairly close to their levels of consulting earnings in 2001, and the relatively rare chemists with a bachelor's degree and earnings from consulting improved their median incomes from this source, raising them from \$1,000 in 2001 to \$1,310 in 2002. As in the past, academic chemists and those employed outside manufacturing were the most likely to have earnings from consulting. Men were more likely than women to tap these sources of income. Differences in typical rates widened considerably, going from \$100 per hour for men and \$90 per hour for women in 2001 to \$125 and \$75, respectively, in 2002. Much of the difference between the rates for men and women is a product of the younger age and generally lower degree levels for women.

As in earlier surveys, increased professional experience is strongly associated with both having consulting income and having higher consulting rates.

TABLE 4. CONSULTING DONE IN 2002

	% Consult	Hourly Rate	Median Income
ALL CHEMISTS	10.2%	\$115	\$600
DEGREE			
B.S.	4.7%	\$8	\$1,310
M.S.	7.2%	\$90	\$1,110
PH.D.	12.7%	\$125	\$500
EMPLOYER			
INDUSTRY—MFG.	3.6%	\$100	\$600
INDUSTRY—NON MFG.	11.9%	\$100	\$1,290
GOVERNMENT	4.6%	\$100	\$300
COLLEGE OR UNIV.	21.3%	\$125	\$500
SEX			
MEN	11.3%	\$125	\$650
WOMEN	6.3%	\$75	\$470
AGE			
20–29	1.1%	\$75	\$240
30–39	6.0%	\$90	\$400
40–49	8.8%	\$120	\$560
50–59	14.0%	\$125	\$800
60–69	20.2%	\$140	\$810

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

BONUSES Nearly half (49.3%) of the chemists participating in the 2003 survey were eligible for bonuses in 2002, a rise compared to 2001 when 45.6% of the respondents reported that they were eligible. In both surveys, close to 90% of those eligible for bonuses received them; those with doctoral degrees were somewhat less likely to be eligible but receiving 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; and similar distinctions applied to men.

TABLE 5. BONUSES RECEIVED IN 2002

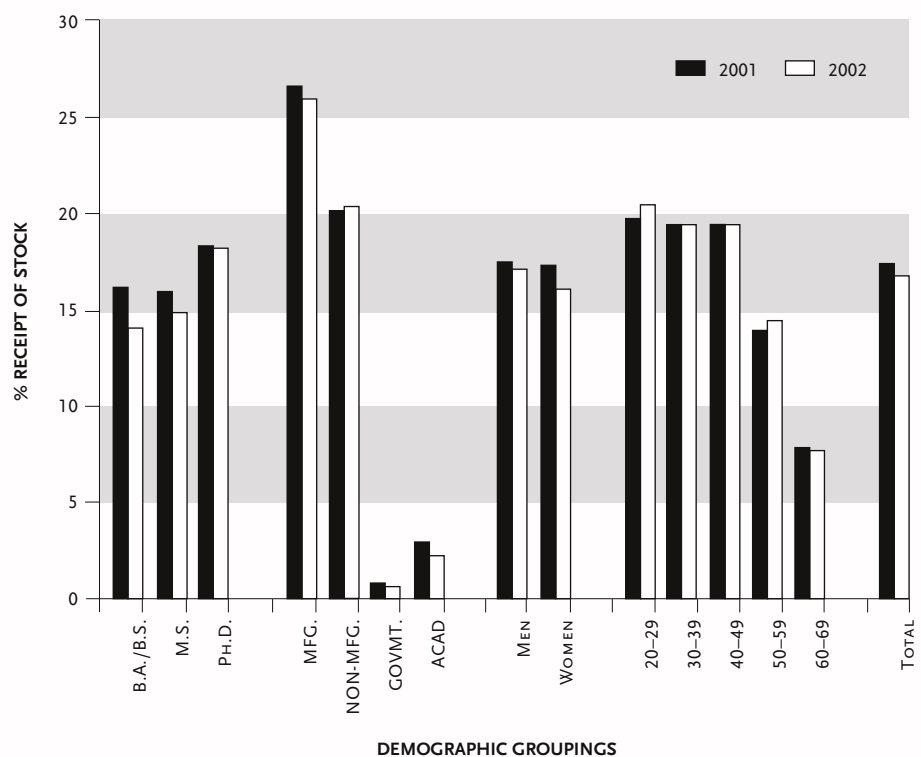
	% Eligible	% of Eligible Received	Median Bonus
ALL CHEMISTS	49.3%	88.0%	\$5,240
DEGREE			
B.S.	56.6%	87.4%	\$3,000
M.S.	55.1%	88.8%	\$4,830
PH.D.	45.6%	88.0%	\$7,500
EMPLOYER			
INDUSTRY—MFG.	70.3%	89.7%	\$6,500
INDUSTRY—NON MFG.	52.4%	81.9%	\$4,000
GOVERNMENT	36.5%	82.8%	\$1,500
COLLEGE OR UNIV.	8.6%	84.7%	\$2,500
SEX			
MEN	50.8%	87.6%	\$6,000
WOMEN	44.4%	89.8%	\$4,000
AGE			
20–29	49.7%	88.4%	\$2,000
30–39	52.0%	89.6%	\$4,000
40–49	53.8%	87.7%	\$7,000
50–59	48.4%	87.3%	\$8,220
60–69	32.6%	85.9%	\$5,220

Note: This year's respondents asked for pervious year's bonuses.

STOCK AS PART OF PROFESSIONAL INCOME

Beginning in 2002, ACS asked its salary survey respondents if they receive stock as a part of their compensation. Results for this question in 2003, asking for 2002 information, are virtually identical to those in 2001: 16.5% report receiving stock. This kind of compensation is reported by 25.5% of those employed in manufacturing and by 20.0% of those working for private companies outside manufacturing. Very few academic chemists also report receiving stock, and a few chemists employed by governments also reported such awards. Those with doctoral degrees were more likely to report awards of stock (17.9%) in 2002 than were those with master's degrees or bachelor's degrees (14.6% and 13.8%, respectively).

FIGURE 3. RECEIPT OF STOCK AS PART OF PROFESSIONAL INCOME FOR CHEMISTS RECEIVED IN 2001 & 2002



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

Employment and Unemployment

EMPLOYMENT STATUS Respondents are asked for their employment status as of March 1st of the year of the survey. The mid-1990s witnessed relatively high unemployment² for chemists. By 2001, 91.8% of the salary survey respondents had full-time jobs and the unemployment rate declined to only 1.5 percent. However, since 2001, full-time employment declined to 88.3 percent in 2002, and it continued to drop in 2003, to 87.9%. At the same time, the unemployment rate rapidly climbed to record levels with a record-breaking 3.5 percent in 2003. Proportions of those with part-time positions remained relatively high at 2.9%. And the share of those with postdoctoral appointments remained very low at 1.4%.

TABLE 6. EMPLOYMENT STATUS OF CHEMISTS, 1995–2003

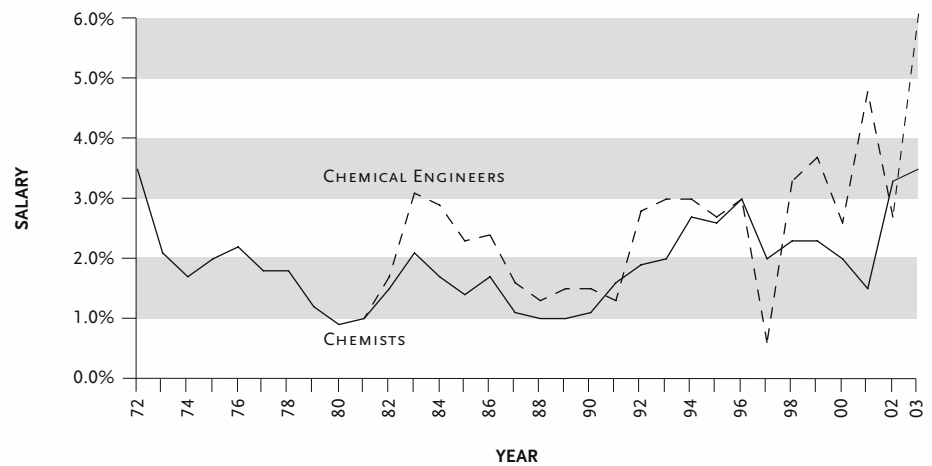
(% by Year)	1995	1996	1997	1998	1999	2000	2001	2002	2003
FULL TIME	88.8	89.4	90.5	89.8	89.4	88.7	91.8	88.3	87.9
PART TIME	2.7	2.7	2.1	2.4	2.6	2.9	2.4	2.8	2.9
POST DOC	3.5	2.7	2.3	2.2	2	2	1.3	1.4	1.3
NOT EMPLOYED									
SEEKING	2.5	2.9	1.9	2.3	2.2	2.9	1.5	3.1	3.3
NOT SEEKING	2.6	2.3	0.8	0.9	1.3	1.7	1.4	1.5	1.7
FULLY RETIRED	—	—	2.3	2.4	2.5	2.8	1.6	2.8	2.9
UNEMPLOYMENT RATE	2.6	3.0	2.0	2.3	2.3	2.0	1.5	3.3	3.5

² The Unemployment rate is calculated according to federal measure. Those not in the workforce – either retired or not seeking employment – 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 2003, and rates of joblessness for chemical engineers reached an unprecedented 6.1%. Detailed tabulations appended to this report (see tables 7-1 through 9-2) show that, as in 2002, increased unemployment has been concentrated in chemists working in manufacturing and over the age of 45, although unemployment among the youngest entry-level people has also increased. Traditional employers of chemists such as agricultural chemical and rubber products manufacturers had unemployment rates of 10.0% or more. A third of the unemployed chemists consisted of persons aged 40 or more who had been out of work for a year or more.

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



Technical Notes

THE SAMPLE The target population of the 2003 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. The sample was not available during the traditional mailing period of the last week in February. Thus a postcard asking members to complete the survey at the ACS Website was mailed to 22,500 members during the first week of March 2003. For those who did not complete the survey on the Web, the printed survey questionnaires were mailed to members by first-class mail during the third week of March 2003. The third mailing consisted of a reminder postcard mailed about a week after the first printed mailing. A follow-up fourth and another full mailing consisting of the survey questionnaire was sent to non-respondents during the week of April 15, 2003. By the May 15th cut-off date, 9,492 usable questionnaires (42 percent of the original mailing) had been returned. The 42 percent response rate represents a continuation of the response rate decrease over the past three years that saw response rates of 51 percent in 1999 and 53 percent in 2000 for the survey, 44 percent in 2001 and in 2003, the lowest (42%) in more than a decade.

Because the sample and subsequent respondents were deemed significantly older than the ACS workforce population, the responses were weighted in this report, *C&EN* and *Today's Chemists* stories to reflect the actual age distribution of the ACS workforce population from which the sample was drawn. However, since the detailed tables in this report are by "years since bachelor's and age-related detail, they are not weighted.

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, 2003. 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 Ph.Ds. 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^3 was only 0.57 between the two groups. The percent in both groups that were unemployed was also the same – 1.6%.

³ 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

	Abbreviation	Employer	
EMPLOYERS	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	

	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	WEST SOUTH CENTRAL	SOUTH ATLANTIC
Alaska	Arkansas	Delaware
California	Louisiana	District of Columbia
Hawaii	Oklahoma	Florida
Oregon	Texas	Georgia
Washington		Maryland
	EAST NORTH CENTRAL	North Carolina
MOUNTAIN	Illinois	South Carolina
Arizona	Indiana	Virginia
Colorado	Michigan	West Virginia
Idaho	Ohio	
Montana	Wisconsin	NEW ENGLAND
Nevada		Connecticut
New Mexico	EAST SOUTH CENTRAL	Maine
Utah	Alabama	Massachusetts
Wyoming	Kentucky	New Hampshire
	Mississippi	Rhode Island
WEST NORTH CENTRAL	Tennessee	Vermont
Iowa		
Kansas	MIDDLE ATLANTIC	
Minnesota	New Jersey	
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	Age		8.2.1	65
	Race/Ethnicity		8.3.1	66
	Citizenship		8.4.1	67
	Type of Employer		8.5.1	68
	Industrial		8.5.2	69
	Academic		8.5.3	70
	Non-academic Work Function		8.6.1	71
	Work Specialty		8.7.1	72
	Geographic Region		8.8.1	73
UNEMPLOYED CHEMISTS	LENGTH OF UNEMPLOYMENT BY:			
	Highest Degree		9.1.1	74
	Age		9.2.1	75
DEMOGRAPHIC CHARACTERISTICS : ALL RESPONDENTS	HIGHEST DEGREE AND:			
	Sex		10.1.1	76
	Age		10.2.1	76
	Men		10.2.2	77
	Women		10.2.3	77
	Work Specialty		10.3.1	78
	Race/Ethnicity		10.4.1	79
	RACE/ETHNICITY AND:			
	Sex		10.5.1	80
	Citizenship		10.6.1	81
	GEOGRAPHIC REGIONS AND:			
Age		10.7.1	82	
Non-academic Work Function		10.8.1	83	
Work Specialty		10.9.1	84	
Sex		10.10.1	85	
Highest Degree		10.11.1	86	