American Chemical Society
Department of Career Services

STARTING SALARIES
Of Chemists and Chemical Engineers

2002

Analysis of the American Chemical Society's
Survey of Graduates in Chemistry
and Chemical Engineering

Starting Salaries of Chemists and Chemical Engineers 2002

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Available from the ACS Office of Society Services

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Acknowledgements

Each year, at the direction of its Council Committee on Economic and Professional Affairs, the American Chemical Society (ACS) surveys recent chemistry and chemical engineering graduates to determine trends in starting salaries and employment status. This report presents detailed results of the 2002 new graduate study. Summaries of the survey findings were published in the March 18th, 2002 issue of Chemical & Engineering News.

Mary Jordan and Janel Kasper-Wolfe conducted this year's survey and provided the tables for this report. Bruce Millar, Janel Kasper-Wolfe and Mary Jordan wrote the summary on the following pages. Special thanks go to the 3,098 graduates who took the time to respond to this year's survey.

Ena Castro, *Assistant Director*
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Summary of Findings

In general, B.S. and Ph.D. chemists who received their degrees between July 2001 and June 2002 had lower median salaries. But the dip in salaries and employment was less severe than in the overall job market. However, the median salary for inexperienced M.S. chemists increased by about $2,000 in 2002. As with the two previous years, the employment status for Ph.D.s held steady with a relatively high 45% of 2001-02 graduates having permanent full-time jobs. Employment status for inexperienced bachelor's was 26% and 38% for master's, respectively. In 2002, the percent of Ph.D. chemists who accepted postdoctoral fellowships was 40 percent, compared to 44 percent in 2000.

Salaries for the Class of 2002: Means and Median

Mean salaries represent the average starting salary and are subject to distortion usually due to some very high individual salaries. They are, however, used in statistical analysis. The median salary is used as the descriptive statistic. The median is the salary representing the midpoint of the salary range for new graduates, where half of the salaries are above the median salary and half of the salaries are below.

Median starting salaries of new graduates are a summary measure. Thus, any trends must be seen as a combination of factors affecting the responding population. Some of these factors are: regional differences in pay structures, characteristics of the new graduates, the type of employer, the size of employer, the work function performed, and the type of industry that hires a large proportion of new graduates. Table 1 presents the 2002 median salaries for new chemistry and chemical engineering graduates based on their degree and level of experience.

TABLE 1. 2002 MEDIAN SALARIES FOR ALL NEW GRADUATES EMPLOYED FULL-TIME BY EXPERIENCE (MEDIAN SALARY IN DOLLARS)

	Chemistry			Chemical Engineering		
	BA/BS	MS	PhD	BA	MS	PhD
Less than 12 months	$31,000	$45,000	$67,000	$50,000	$59,000	$75,000
12–36 months	$34,100	$41,000	$65,000	$52,000	$63,750	$65,000
More than 36 months	$40,000	$55,000	$70,000	$55,400	$62,750	$80,000

The median salary of the bachelor's chemistry varied with the level of experience. The median salary for the more experienced bachelor's chemistry graduates who had more than 36 months of experience was $40,000. The median salary for new bachelor's chemistry graduates who had less

than 12 months experience was $31,000. The median salary for master's chemical engineering graduates was around $63,750.

Overall, chemistry and chemical engineering graduates experienced modest gains in mean starting salaries between 2001 and 2002. The mean starting salary for M.S. chemists increased by 5.2 percent and by 1.7 percent for Ph.D. chemists. The latter increase was not enough to keep pace with inflation.[1] The mean starting salary for inexperienced (less than 12 months experience) B.S. chemists was $32,657, a 3.1 percent decline.

TABLE 2. 2002 MEAN SALARIES FOR INEXPERIENCED CHEMISTRY GRADUATES

$32,657 (down from $33,695) for the B.S.,-3.1%, or in constant dollars down -5.1%
$45,458 (up from $43,187) for the M.S., +5.2%, or in constant dollars up $3.2%
$63,614 (up from $62,549) for the Ph.D, +1.7%, or in constant dollars down -0.3%

TABLE 3. 2002 MEAN SALARIES FOR INEXPERIENCED CHEMICAL ENGINEERING GRADUATES

$47,842 (down from $49,049) for the B.S., down 2.5%, or in constant dollars down -4.5%
$56,938 (up from $56,322) for the M.S., up 1.0%, or in constant dollars down -1.0%
$76,278 (up from $74,387), or up 2.5%, or in constant dollars up 0.5%

Tables 2 and 3 show the comparison of mean salaries in 2001 and 2002 for inexperienced chemistry and chemical engineering graduates. In 2002, new bachelor's for chemistry graduates experienced decreases in overall starting salary levels. The mean salary for new bachelor's chemistry graduates decreased by 3.1 percent in 2002 to $32,657 compared with $33,695 in 2001. The mean salaries for the master's chemistry graduates and Ph.D.s showed a gain. The mean salary for master's chemistry graduate increased by 5.2 percent, from $43,187 in 2001 to $45,458 in 2002. The mean salary for a new chemical engineering graduate decreased 2.5 percent, dipping from $49,049 in 2001 to $47,842 in 2002. The mean salary for a new Ph.D. chemist increased from $62,549 in 2001 to $63,614 in 2002, an increase of 1.7 percent. New chemical engineering Ph.D.s experienced an increase of 2.5 percent in the mean salary that increased to $76,278 in 2002.

[1] The Consumer Price Index rose 2.0 percent from Oct. 2001 to Oct. 2002. It is used as an approximation for inflation.

Most of the changes in mean salaries were not sufficient to outpace inflation. The exceptions were new M.S. chemists and new Ph.D chemical engineers which recorded 3.2% and 0.5% increases, respectively, in constant dollars.

Figure 1 shows that after uneven years in the mid-1990s when there was a decade of stagnant or no growth for bachelor's chemists, all three degrees have shown strong rebounds beginning with the Class of 1997 and continuing until this year. On the other hand, salaries for chemical engineers fluctuated at the doctorate level in the mid-1990s. On the whole, chemical engineers have posted relatively consistent starting salary increases since 1975.

FIGURE 1. MEDIAN STARTING SALARIES FOR INEXPERIENCED CHEMISTS WORKING FULL-TIME (IN CURRENT DOLLARS 1975-2002)

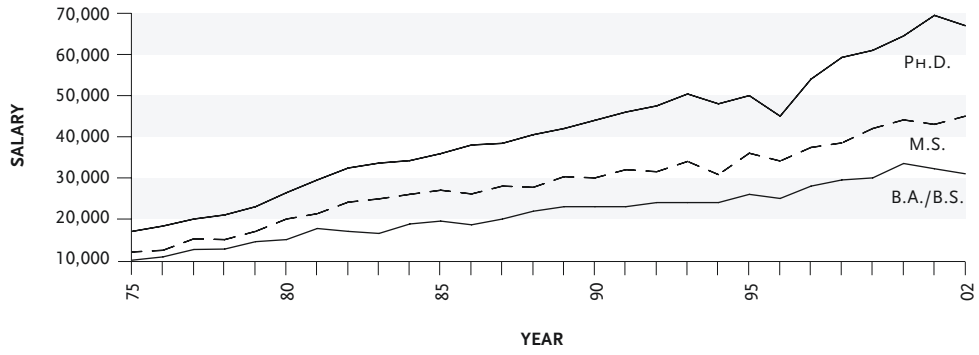


FIGURE 2. MEDIAN STARTING SALARIES FOR INEXPERIENCED CHEMICAL ENGINEERS WORKING FULL-TIME (IN CURRENT DOLLARS 1975-2002)

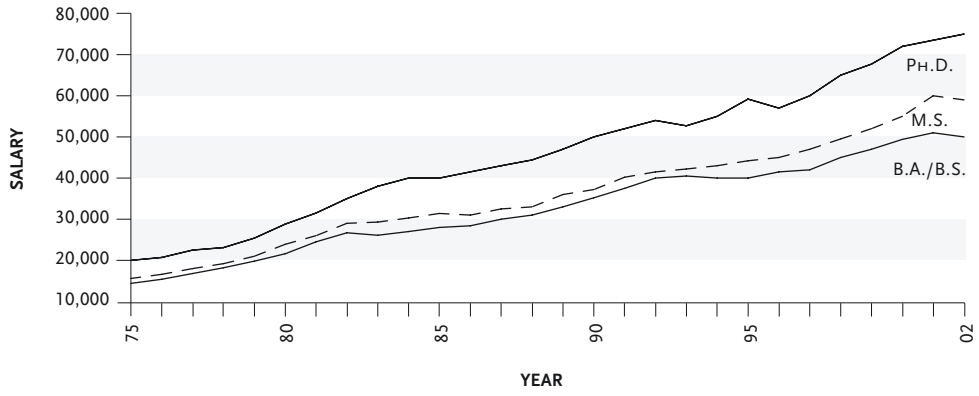


TABLE 4. MEDIAN STARTING SALARIES FOR INEXPERIENCED GRADUATES 1975-2001 (BY DEGREE AND IN 1000S OF CURRENT DOLLARS)

	Chemistry			Chemical Engineering		
Year	BA/BS	MS	PhD	BA	MS	PhD
1975	10.0	12.0	17.0	14.4	15.6	20.0
76	10.8	12.4	18.3	15.4	16.6	20.7
77	12.6	15.2	20.0	16.8	18.0	22.5
78	12.7	15.0	21.0	18.2	19.2	23.1
79	14.5	17.0	23.0	19.8	21.0	25.4
1980	15.0	20.0	26.4	21.6	23.9	28.8
81	17.7	21.3	29.5	24.5	26.0	31.5
82	17.0	24.1	32.4	26.7	29.0	35.0
83	16.5	24.9	33.6	26.1	29.3	38.0
84	18.8	26.0	34.2	27.0	30.3	40.0
1985	19.5	27.0	35.9	28.0	31.4	40.0
86	18.6	26.1	38.0	28.4	31.0	41.5
87	20.0	28.0	38.4	30.0	32.5	43.0
88	21.9	27.7	40.5	31.0	33.0	44.4
89	23.0	30.3	42.0	33.0	36.0	47.0
1990	23.0	30.0	44.0	35.2	37.2	50.0
91	23.0	32.0	46.0	37.5	40.2	52.0
92	24.0	31.5	47.5	40.0	41.5	54.0
93	24.0	34.0	50.4	40.5	42.2	52.7
94	24.0	30.8	48.0	NA	NA	NA
1995	25.0	36.0	50.0	40.0	44.2	59.2
96	25.0	34.1	45.0	41.5	45.0	57.0
97	28.0	37.5	54.0	42.0	47.0	60.0
98	29.5	38.5	59.3	45.0	49.8	65.0
99	30.0	42.0	61.0	47.0	52.0	67.7
2000	34.3	44.1	64.5	49.4	55.0	72.0
01	32.2	43.0	69.5	51.0	60.0	73.5
02	31.0	45.0	67.0	50.0	59.0	75.0

Table 4 shows that starting salaries notched a steady increase each year for inexperienced M.S. chemists since 1996 but dipped during the same period for B.S. and Ph.D. graduates. Over the same time period, starting salaries increased each year for B.S. and M.S. chemical engineers before declining in 2002. New Ph.D. graduates in chemical engineering were the only group to have uninterrupted starting salary increases for the past seven years.

Tables 5 and 6 show the percentile ranges for chemistry and chemical engineering graduates. As noted earlier, the median is much higher for chemical engineering new graduates. Nonetheless, the standard deviation for new chemists' salaries tend to be greater and in many cases the very top salaries go to new grads in chemistry. The lowest salaries also tend to go to chemistry graduates.

TABLE 5. RANGES OF STARTING SALARIES OF INEXPERIENCED FULL-TIME EMPLOYED CHEMISTRY GRADUATES BY DEGREE: 2000, 2001 AND 2002 (IN $S)

	DEGREE LEVEL								
	Bachelor's			Master's			Doctorate		
Salaries	2000	2001	2002	2000	2001	2002	2000	2001	2002
90th Percentile	45,000	45,000	45,000	54,600	55,003	57,600	80,000	80,000	83,500
75th Percentile	39,000	39,000	38,000	50,000	53000	54,000	74,450	75,000	75,000
50th Percentile	33,500	32,224	31,000	44,100	43,000	45,000	64,500	69,000	67,000
25th Percentile	29,000	27,000	26,000	35,000	33,500	37,000	50,250	53,000	50,000
10th Percentile	25,000	24,000	22,000	26,200	30,000	30,800	37,460	37,800	38,990
Mean	34,281	33,695	32,657	43,870	43,187	45,458	62,549	63,100	63,614
Count	477	481	337	220	55	35	48	127	85
Standard Deviation	8,218	9,205	10,138	12,082	10,800	11,291	16,892	16,242	18,398

TABLE 6. RANGES OF STARTING SALARIES OF INEXPERIENCED FULL-TIME EMPLOYED CHEMICAL ENGINEERING GRADUATES BY DEGREE: 2000, 2001 AND 2002 (IN $S)

	DEGREE LEVEL								
	Bachelor's			Master's			Doctorate		
Salaries	2000	2001	2002	2000	2001	2002	2000	2001	2002
90th Percentile	56,000	55,600	57,760	62,800	65,530	—	82,000	85,680	90,000
75th Percentile	52,000	54,500	54,000	60,000	61,500	63,000	77,000	80,000	83,000
50th Percentile	49,400	51,000	50,000	54,960	60,000	59,000	72,000	73,500	75,000
25th Percentile	45,000	46,000	44,000	49,250	55,250	55,625	65,000	71,000	71,000
10th Percentile	38,000	35,290	34,599	38,854	37,500	44,000	61,200	64,800	63,800
Mean	48,121	49,049	49,049	53,409	56,322	56,938	73,115	74,387	76,278
Count	417	207	155	33	16	52	55	35	25
Standard Deviation	7,346	7,570	9,639	9,075	11,013	10,009	13,318	8,262	9,718

SALARY FACTORS

As stated previously, salaries vary by the type and characteristics of the employer as well as the characteristics of the graduate. Other factors may include the size of the employer, the employer's geographic location and whether the new graduate received certification from an ACS-approved program.

For instance, median salaries are typically higher in private industry and lower in educational institutions. The median salary for new chemistry Ph.D.s was $70,500 for those employed full-time in the manufacturing sector, $71,250 in the non-manufacturing sector, and $39,578 for those employed in colleges and universities.

The manufacturing sector offered the highest salaries for new bachelor's chemists and inexperienced master's chemists. The highest median salary for chemistry Ph.D.s was $71,250, for those working in the non-manufacturing sector. The new bachelor's chemistry graduates who worked for the federal government ($35,308). The median salary for inexperienced master's chemists working in manufacturing was $51,250.

For inexperienced B.A./B.S. and M.S. chemists with new jobs in the manufacturing sector, the median salaries were $34,000 and $51,250 respectively. New bachelor's chemists who went to work in colleges or universities had a median starting salary of $28,000.

Gender can be another key factor in starting salaries. In examining the median salaries for full-time employment of chemistry and chemical engineering graduates in industry indicates that with only three exceptions (BA/BS chemistry, MS Chemical Engineering and Ph.D. Chemistry), the median salary of male graduates was higher than their female colleagues.

As with chemists in general, the growth of employment of chemists in industry since the mid-1900s has been dominated by growth in the pharmaceutical industry. The single largest employer of new grads in 2002 was again the pharmaceutical industry. This employer also paid top median starting salaries for inexperienced chemists: $36,200 for inexperienced bachelor's chemists; $54,000 for master's and $77,000 for doctorates.

In 2002, the petroleum industry offered the highest starting median salaries to inexperienced bachelor's chemical engineers at $56,600 with the basic chemicals industry second at $54,350.

In industry, larger employers generally pay more than smaller ones. In fact, one of the strongest predictors of starting salaries is the size of the company. Bachelor's chemists in larger firms (25,000 or more employees) started at about $11,636 more than those employed in small firms (less than 50 employees).

New M.S. chemists in industry are apt to work at all sizes of firms. M.S. chemists started at $55,500 at large firms, or $16,000 more than at small firms. Ph.D.s tend to work at firms larger than 25,000 employees, where their starting salaries were $83,000, while the median for smaller companies was $70,000, or $13,000 less than at larger firms.

Regional differences in pay tend to be tied to the type and size of employers in the region (for a list of regions see page 16). Salaries for bachelor's chemistry graduates were highest in the Middle Atlantic, New England, Pacific and West North Central. In those regions, they ranged from $34,000 to $31,500. They were lowest in the East South Central, Mountain and South Atlantic, ranging from $24,158 to $30,000. Median salaries for new B.S. chemical engineers were highest for those employed in the West South Central, New England, and the Pacific regions ($53,500 to $52,000) and lowest in Mountain, Middle Atlantic, South Atlantic and West North Central ($47,000 to $43,500), respectively.

Proportionally, bachelor's chemical engineers were employed nationwide with an edge to the Middle and South Atlantic states, the East South Central, and the West South Central.

Generally speaking, bachelor's chemists receive higher starting salaries if they received certification from an ACS-approved program. The overall median salary for inexperienced B.A./B.S. chemists who were certified was $33,200, compared with $30,000 for chemists without certification

GRADUATE AND POST-DOCTORAL STIPENDS

Bachelor's and master's graduates in chemistry who were on graduate assistantships or fellowships at a university typically receive $19,725 for B.S. chemical engineers and $19,000 for M.S. chemical engineers, an increase from $18,000 in 2000. Stipends for academic postdoctoral fellowships for Ph.D. chemists were $30,000, the same as in 2001. In 2002, Ph.D. chemical engineering graduates received a stipend of $35,000. Stipends for graduates in manufacturing tended to be higher across the board for all graduates. In 2002, the median manufacturing stipend for bachelor's chemists was $33,000 and $40,000 for master's chemistry graduates.

BACHELOR'S CHEMISTS AND THEIR FIRST JOBS

Median starting salaries for new bachelor's chemistry graduates tend to be very dependent on the type of job he or she has obtained. Research and management jobs pay the most for new graduates. New chemistry graduates who worked in development and design had the highest median salary ($36,500). The largest number of respondents to the survey (112) worked in production and quality control where the median starting salary was $30,600.

Historically, chemical engineering graduates have fared better in starting salaries than chemistry graduates. While chemists' starting salaries were mixed in the 1980s and till the mid-1990s, chemical engineers graduates consistently gained increases in starting salaries. This did not continue with the Class of 2002.

The median starting salary for new bachelor's chemical engineering graduates dropped to $50,000 in 2002, compared with $51,000 in 2001. The only increase was for new Ph.D. chemical engineering graduates. Their median starting salary increased to $75,000, up from $73,500 in 2001. See Table 4 for median starting salaries of inexperienced graduates by degree from 1975 to 2001.

POST GRADUATION EMPLOYMENT STATUS

Table 7 addresses the post graduate employment status of new graduates. In 2002, the largest single proportion of BA/BS chemistry graduates (52.4 percent) indicated that they intended to enroll in graduate schools. This indicates an increase in the proportion of new chemistry graduates who pursue advanced programs over the previous year. In 2001, 52 percent of the new graduates went into full-time graduate programs.

TABLE 7. POST-GRADUATION PLANS OF CHEMISTRY AND CHEMICAL ENGINEERING GRADUATES BY DEGREE

	BS/BA Chemistry	BS Chemical Engineering	MS Chemistry	MS Chemical Engineering	PhD Chemistry	PhD Chemical Engineering
Full-time permanent	25.50%	58.80%	38.20%	32%	44.80%	66.10%
Full-time temporary	9.80%	3.80%	5.00%	4.00%	5.70%	3.20%
Postdoc/grad	46.40%	18.50%	47.30%	56.00%	40.40%	24..2%
Part-time permanent	1.30%	0.20%	1.10%	0.00%	0.30%	1.60%
Part-time Temporary	5.70%	3.30%	1.50%	0.00%	1.60%	0.00%
Not employed and seeking	5.80%	13.70%	4.60%	8.00%	4.70%	2.90%
Not employed-not seeking	5.50%	1.70%	2.30%	0.00%	2.50%	2.90%

While the proportion of new bachelor's chemistry graduates who took full-time temporary employment remained relatively stable (9.8 percent) over the last two years, only 26 percent of the new chemistry graduates had full-time permanent employment. This compares with 31 percent of new graduates in full-time permanent employment in 2001. On the other hand, the majority of new bachelor's chemical engineering graduates (59 percent) had full-time permanent employment and only 19 percent went into graduate programs.

In 2002, 6 percent of new chemistry graduates planned to pursue part time studies, compared with 4.7 percent of new bachelor chemical engineering graduates.

POSTDOCTORAL FELLOWSHIPS

In 2002, the proportion of Ph.D. chemists who accepted postdoctoral fellowships was much higher than Ph.D. chemical engineering. In 2002, the percentage of Ph.D. chemists who accepted postdoctoral fellowships was 40 percent, compared to 44 percent in 2000. On the other hand, 24 percent of PhD chemical engineering graduates accepted postdoctoral fellowships, compared to 19 percent in 2000. In short, almost twice as many Ph.D. chemistry graduates accepted fellowships compared to Ph.D. chemical engineering graduates. This implies that the employment opportunities that are available to these two groups differ significantly. Full-time employment is a strong option for Ph.D. chemical engineering graduates.

PLANS FOR ADVANCED STUDY

Table 8 addresses the plans for further studies of new bachelor chemists and chemical engineering graduates. About 53.4 percent of new chemistry graduates were planning on pursuing advanced studies in the fall of 2002. The majority of those who planned to enroll in graduate school were intending to study full-time (47.6 percent) and 5.8 percent were planning to study part-time in the fall.

TABLE 8. PLANS FOR FURTHER GRADUATE STUDIES FOR CHEMISTRY AND CHEMICAL ENGINEERING GRADUATES: FALL 2002

Plans	Chemistry	Chemical Engineering
Total further studies	52.40%	23.20%
Full-time	46.40%	18.50%
Part-time	6.00%	4.70%
No plans for further studies	47.60%	76.80%
Total*	100.00%	100.00%
Number of responses	882	478

**Note: Any deviation from 100 is due to rounding.*

The majority of bachelor's in chemical engineering (76.8 percent) had no plans for any graduate study. In 2002, the new B.S. chemical engineering graduates showed a significant drop in propensity to enter graduate school compared with 2001. About 23 percent had decided to pursue either part-time or full-time studies in 2002 compared with 38 percent in 2001. See Table 8 on the plans for further studies of new bachelor's chemists and chemical engineering graduates. Of those chemical engineers who were planning on attending graduate school, 18.5 percent of them planned to study full-time and only 4.7percent planned to study part-time in the fall of 2002.

TABLE 9. FIELDS OF STUDY OF BACHELOR'S CHEMISTRY AND CHEMICAL ENGINEERING GRADUATES WHO PLAN FURTHER STUDY: FALL 2002

Plans	Chemistry	Chemical Engineering
FULL-TIME STUDY		
Chemistry and biochemistry	53.30%	5.10%
Chemical or biochemical engineering	0.80%	64.10%
Other engineering	0.70%	3.80%
Physical science	1.90%	1.30%
Life science	2.80%	0.00%
Medicine, dentistry, or pharmacy	33.50%	9.00%
Business or management	0.40%	5.10%
Education	2.20%	0.00%
Law	2.30%	9.00%
All others	2.10%	2.60%
Total*	99.90%	100.00%
Number of responses	906	58
PART -TIME STUDY		
Chemistry or biochemistry	51.70%	0.00%
Chemical or biochemical engineering	2.60%	30.00%
Other engineering	0.90%	20.00%
Physical science	4.30%	0.00%
Life science	8.60%	0.00%
Medicine, dentistry, or pharmacy	12.90%	10.00%
Business or management	5.20%	30.00%
Education	7.80%	0.00%
Law	0.80%	10.00%
All others	5.20%	0.00%
Total*	99.90%	99.90%
Number of responses	116	30

**Note: Any deviation from 100 is due to rounding.*

The trend for full-time permanent employment for Ph.D. chemistry graduates remained stable over the last two years. For Ph.D. chemistry graduates, full-time employment remained steady at 45 percent in 2001 and 2002. However, full-time permanent employment for Ph.D. chemical engineering graduates fell to 66 percent from 71 percent in 2001. In 2002, the new Ph.D. chemical engineering graduates who reported that they were unemployed and seeking employment decreased to 3 percent from 6 percent in 2001. The proportion of new Ph.D. chemistry graduates who were unemployed and seeking employment rose from 3 percent in 2001 to 5 percent in 2002. See Table 8 for post graduation employment status for chemistry and chemical engineering graduates.

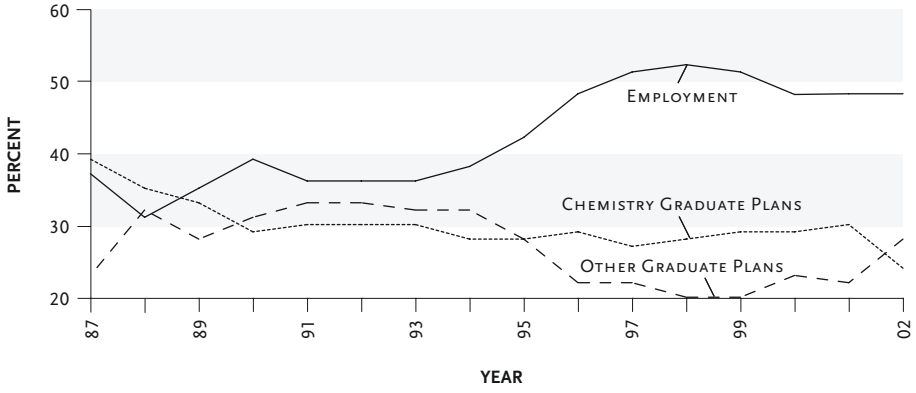
BA/BA chemistry and chemical engineering graduates tend to enroll full-time graduate programs. About 53 percent of chemistry graduates who planned to attend graduate programs indicated that they were planning further studies in the fields of chemistry and biochemistry. This was followed by 33.5 percent of the chemistry graduates enrolling in medicine, dentistry or pharmacy. The majority (64 percent) of the chemical engineering graduates who planned to attend graduate school indicated that they intended to pursue further studies in the field of chemical or biochemical engineering.

Among the chemistry graduates, more female respondents (3 percent) reported that they planned part-time studies in biochemistry during the fall, while only 2 percent of the male chemistry graduates indicated an interest in that same field. Table 9 addresses the fields of further studies of new bachelor's chemists and chemical engineering graduates.

THE CHANGING FALL PLANS OF BACHELOR'S CHEMISTS

The trend for post-graduation plans among BS/BA chemistry graduates over the last fifteen years is shown in figure 3. The data presented compare plans of new graduates to immediately pursue employment opportunities, enroll in chemistry graduate programs or enroll in other graduate programs. Traditionally, the post-graduation plans for bachelors' chemists showed about one-third went directly to employment and about two-thirds went to graduate study in some field. The traditional breakdown changed in the mid-1990s when employment for chemists was going through a turbulent period of change in where chemists worked and the types of chemistry practiced.

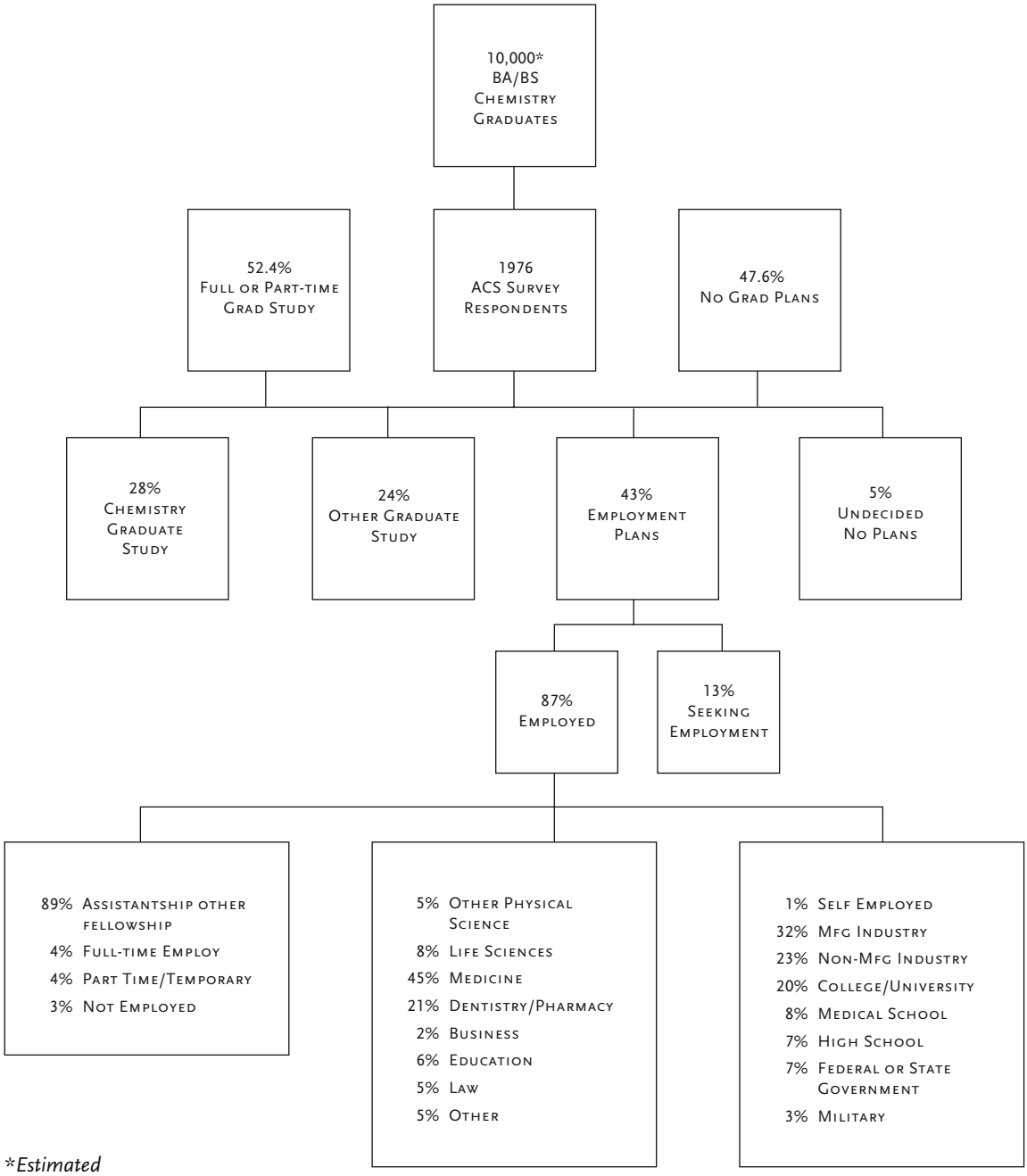
FIGURE 3. POST GRADUATION PLANS OF BS/BA CHEMISTRY GRADUATES: 1987–2002



The trend for employment-only plans among new chemistry graduates has been increasing from 1994 to 1999, peaking at 52 percent in 1998. Over the last several years, this trend tended to level out at 47 percent in 2000 and 48 percent in 2001 and 2002, indicating that today almost half of BS/BA chemistry graduates tend to enter the job market after graduation. For the Class of 2002, graduate studies in chemistry again superceded other graduate plans. The data reflects a trend, which reflects declining enrollment in chemistry graduate programs over 7 years, only showing some recovery in 2002.

Figure 4 shows the detailed post-graduation plans of 2002 chemistry bachelor's graduates. The percentage of bachelor's chemists who planned to continue graduate study in chemistry climbed from 22 percent in 2001 to 28 percent in 2001.

FIGURE 4. POST GRADUATION PLANS OF 2002 BACHELOR'S CHEMISTRY GRADUATES



**Estimated*

Of the chemistry graduates who chose immediate employment, 87 percent reported that they were currently employed and 13% reported that they were seeking employment. Of those chemistry graduates who chose immediate employment, the majority chose industrial employment in the manufacturing sector (32 percent). The proportion that chose employment in colleges and universities increased to 20 percent in 2002 as compared to 12 percent in 2001. The proportion of bachelor's chemists who chose to work for the federal or state government remained at 7 percent.

BACHELOR'S GRADUATES CERTIFIED TO ACS FROM APPROVED PROGRAMS

In 2002, there was no difference between the proportion of certified graduates planning further studies (46.6 percent) and than those graduates who are not certified (46.5 percent.) The unemployment rate for certified and non-certified graduates was 5.8 percent in 2002. However, during 2001, the unemployment rate for bachelor's graduates certified from ACS approved programs was 6.0 percent.

DEMOCRATIC COMPOSITION OF NEW GRADUATES

SEX

The participation of women in the fields of chemistry and biochemistry is increasing at the master's and doctorate levels. The proportion of new women graduates of chemistry programs at the master's level was 49 percent and 47 percent at the doctorate level, compared with 45 percent and 39 percent, respectively, in 2001. Although more women responded to the survey than men, the proportion of new women graduates of chemistry programs at the bachelor's level was 55 percent, compared with 53 percent in 2001.

A different trend occurred among new graduates of chemical engineering programs. In 2002, the proportion of women graduates in bachelor's programs climbed to 49 percent from 45 percent. For new mater's graduates the proportion rose from 37 percent in 2001 to 62 percent in 2002. The proportion of women graduates at the doctoral level in chemical engineering increased dramatically from 33 percent in 2001 to 44 percent in 2002.

CITIZENSHIP

In 2002, 95.5 percent of bachelor's chemists and chemical engineers were U.S. citizens. This is a slight decrease from the previous year (2001) when 96 percent of the graduates in both fields were U.S. citizens. The highest proportion of U.S. native graduates are from chemistry and chemical engineering programs at the bachelor's level. The proportion for US native master's chemistry graduates is 64 percent and 54 percent for chemical engineering, respectively. The proportion of US native Ph.D. graduates falls to 45 percent for Ph.D. chemical engineering programs and 70 percent for Ph.D. chemistry programs.

The proportion of bachelor's chemistry and chemical engineering graduates who had a temporary visa remained at the same level in 2001 – 1 percent. Among master's chemistry graduates, the proportion of graduates who have temporary visas climbed to 27 percent in 2002. Among graduates with doctoral degrees, the proportion of graduates who have temporary visas dropped from 21 percent in 2001 to 20 percent in 2002.

Among the master's chemical engineering graduates, the proportion of graduates with temporary visas was 36 percent in 2002. However, the doctoral graduates of chemical engineering programs increased to 25 percent in 2001 and nearly doubled to 43 percent in 2002..

RACE AND ETHNICITY

The number of Asian graduates are an increasing proportion of new graduates in chemistry and chemical engineering. In 2002, Asians were 9 percent of the bachelor's chemists and chemical engineers. However, the proportion of Asian graduates increases to 25 percent among the master's chemistry degree and to 33 percent for the master's of chemical engineering. The proportion of Asian graduates of Ph.D. programs is 18 percent of all Ph.D. chemistry degrees awarded and 36 percent of all Ph.D. chemical engineering degrees awarded.

On the other hand, the opposite trend is observed among the African American population of chemists and chemical engineers. About 5 percent of bachelor's of chemistry degree are awarded to African Americans and 4 percent of the bachelor's of chemical engineering degrees. While the proportion of African American graduates of master's programs dips to 4 percent in chemistry and climbs to 6 percent for chemical engineering, it declines for the doctoral programs. Only 3 percent of the Ph.D. chemistry degrees and zero of the Ph.D. chemical engineering degrees were awarded to African Americans. The same trend is evident among Hispanic population of chemists and chemical engineers. The proportion of bachelor's chemists and bachelor's in chemical engineering is 4 percent in 2002.

Scope and Method

OBJECTIVES

The 2002 New Graduate Study (Starting Salary Survey) is the 52nd in the series of annual surveys on the employment and future plans of new graduates in chemistry and chemical engineering conducted by the American Chemical Society. Summaries of the results of these surveys appear annually in Chemical & Engineering News. The delay in notification of departments of chemical engineering for graduate lists resulted in fewer than expected number of graduates' names and directions becoming available by the time of the survey in October, 2002.

The primary objective of the survey is to gather data on the starting salaries and occupational status of new chemists and chemical engineers who graduated during the 2001-2002 academic year. The survey covers bachelor's, master's, and doctoral degree recipients for chemistry and related fields. Since 1973, the survey provides information on graduates' sex, citizenship, and ethnicity.

METHOD OF COLLECTION AND TIMING OF SURVEY

Chemistry departments approved by ACS and chemical engineering departments approved by the American Institute of Chemical Engineers and the Engineer's Council for Professional Development provided names and addresses of students who graduated between July, 2001 and June, 2002. The survey was mailed out from October through December, 2001 questionnaires were mailed to those graduates whose names had been provided and who had U.S. addresses.

EXTENT OF COVERAGE

Survey questionnaires were mailed by first class mail on 10/30/2002, to 10,140 graduates. Approximately 1 week after the initial mailing, a postcard reminder was sent, then a second questionnaire and cover letter were sent to non-respondents on December 16, 2002. By the cutoff date of January 17, 2003. ACS had received 3,098 usable responses.

The survey for the Class of 2001 was also available in a Web version at http://chemistry.org/careers.html. An introductory postcard was send to 10,140 graduates during the third week of October, 2002 for the Web version.

DEFINITIONS

The term "inexperienced" as used in the tables refers to those who have 12 months or less of prior professional work experience. The term "chemist" refers to one who received a degree in chemistry. Salary tables are based on full-time employment. Postdoctoral salaries are analyzed separately. Salaries are reported in U.S. dollars.

"Certified" bachelor's degree-holders are those bachelor's certified by their department or program to ACS. The certified graduate "has pursued and successfully completed a curriculum as proscribed in the guidelines for ACS-approved programs and that... has received the bachelor's degree." (ACS Committee on Professional Training, 1998).

For this study, race and ethnicity categories are combined to become mutually exclusive. Hispanics may include all racial categories, but racial categories do not include Hispanics.

The Technical Notes present methods for estimating sampling error and also explain certain discrepancies among some of the tables.

GEOGRAPHIC REGIONS

Pacific East
- 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

South Central
- Alabama
- Kentucky
- Mississippi
- Tennessee

Middle Atlantic
- New Jersey
- New York
- Pennsylvania

South Atlantic
- Delaware
- District of Columbia
- Florida
- Georgia
- Maryland
- North Carolina
- South Carolina
- Virginia
- West Virginia

New England
- Connecticut
- Maine
- Massachusetts
- New Hampshire
- Rhode Island
- Vermont

Technical Notes

DISCREPANCIES AMONG TABLES

Because not all individuals responded to all of the survey items, some pairs of tables contain totals that should be identical but are not. For example, one table may group Ph.D.s by sex and another by employer. The totals will differ unless the number who did not indicate their sex is the same as the number who did not indicate their employer.

ESTIMATES OF MEDIAN SALARIES

Median salaries displayed within the cells of the salary tables are sample medians and are therefore subject to sampling error. This error could be quite large, especially when the number of respondents in the corresponding cell is small. Therefore, median salaries in cells with fewer than 15 respondents should not be used to estimate their corresponding population medians.

COMPARING SALARIES

Often questions arise concerning women's salaries as compared with men's, or chemists' salaries as compared with chemical engineers'. These and similar comparisons require caution.

Statistical tests should be performed to determine whether observed differences in salaries of various sample groups could be mere chance occurrences resulting from peculiarities of the samples. Whether a difference in salaries is "statistically significant" depends not only on the magnitude of the difference but also on the sample sizes and the magnitudes of the sample standard deviations.

Discussion of statistical tests of significance may be found in Introductory Statistics for Business and Economics, by Thomas H. Wonnacott and Ronald J. Wonnacott, NY: Wiley, 1990, and in other similar texts.

ESTIMATING SAMPLING ERROR FOR PERCENTS

Percents in this report are derived from the sample. If the entire population had received and returned questionnaires, most estimates would be somewhat different. How much different? Although this question does not have an exact answer, the table below does provide some guidance. To use the table, find the column headed by the percent (p) derived from the sample, and find the row appropriate for the sample size (n). (Approximations for p and n may be used.) Note the number in that column and that row of the table.

This number from the body of the table measures the precision with which the sample percent estimates the percent of the entire population. Specifically, if this procedure is applied repeatedly, about 95 times out of 100, the population percent will differ from the sample percent by no more than the amount shown in the table.

TABLE B–1. APPROXIMATE SAMPLING ERRORS FOR PERCENTS

n	p=10% or 90%	p=20% or 80%	p=30% or 70%	p=40% or 60%	p=50%
50	8.3%	11.1%	12.7%	13.6%	13.9%
100	5.9	7.8	9.0	9.6	9.8
200	4.2	5.5	6.4	6.8	6.9
500	2.6	3.5	4.0	4.3	4.4
1,000	1.9	2.5	2.8	3.0	3.1
2,000	1.3	1.8	2.0	2.1	2.2
5,000	0.8	1.1	1.3	1.4	1.4
10,000	0.6	0.8	0.9	1.0	1.0

In Table B-1a of the full report for example, 1,077 respondents classified as chemists indicated their highest degree as the bachelor's degree and their gender as female. The percent of this group who are employed full-time and permanent is 27 percent (p=27). A "95 percent confidence interval" for this percent may be approximated by taking n and p to be about 1000 and 30 percent. The above table shows an approximate sampling error of 2.8 percent. Hence, the 95 percent confidence interval is 25 percent to 30 percent. If estimates were made at this "level of confidence" from 100 similar samples, about 95 of the confidence intervals calculated from these samples would contain the true population percent.