

2000 STARTING SALARY SURVEY

New chemists and chemical engineers enjoy good salaries and job opportunities

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CHEMISTS AND CHEMICAL ENGINEERS who graduated between July 1999 and June 2000 were greeted by a strong market for their skills, according to the findings of the latest American Chemical Society annual starting salary survey.

Graduates who sought full-time jobs in industry, academia, or elsewhere were able to find them, and their salaries were substantially higher than those paid 1998–99 graduates. In general, it was the fourth consecutive upbeat year for those entering the chemical profession.

As would be expected, this overall strength reflects the very positive situation quantified by ACS's latest annual survey of the salary and employment status of its members as of this spring (C&EN, Aug. 20, page 51).

Median base salaries for 1999–2000 chemical engineering graduates with less than one year of technical work experience prior to graduation were 5 to 6% higher than those for the 1998–99 class at all degree levels. Similarly, inexperienced master's degree and Ph.D. chemistry graduates

posted gains of 5 to 6%. Bachelor's degree chemistry graduates did even better, with an apparent 12% upsurge over the salaries being paid one year earlier. The rate of inflation for the year was close to 3%.

For all chemistry graduates responding, median base salaries were \$34,000 for those with a bachelor's degree, \$45,000 for master's graduates, and \$65,000 for new doctorates. Chemical engineering graduates did better, with medians of \$50,000, \$56,700, and \$72,000, respectively.

Any class of new graduates is a community in flux as its members make their choices among career options. So it is not possible to come up with a single number that accurately summarizes the employment status of the group as a whole.

However, an indication of the strength of the job market for the 1999–2000 class of new chemists is the 45% of doctoral graduates who took full-time jobs. This is up from 43% for the previous class and from a considerably lower 35% as recently as four years ago. On the other hand, the 41% of 1999–2000 chemistry doctorates taking up postdocs was down from 45%

of the 1998–99 class and 51% of the 1996–97 class.

The 2000 survey gathered data as of the week of Oct. 9, 2000. Since then, anecdotal evidence indicates there is continued strong—but reduced from last year—demand for chemists, newly graduated or otherwise. The employment clearings at ACS national and regional meetings this year have had more jobs to offer than applicants—the first time this has happened in many years.

However, it should be noted that the ACS graduate survey was taken just as the longest and strongest economic expansion in U.S. history was cresting last fall. Since then, economic growth has dropped from a heady 5% annual rate to an anemic 1% or less, and the pace of hiring chemical professionals has slowed somewhat, with pharmaceutical companies hiring more than traditional chemical companies.

Unemployment is on the rise nationally after seven years of steady decline that dropped it to a 30-year low last year of below 4%. And mass layoffs again pervade the chemical industry—still the major employer of chemists and an enterprise that has been on an earnings slide for the past year (C&EN, Aug. 20, page 51; Aug. 6, page 26; and July 30, page 15).

STARTING SALARY SURVEY. The results from this year's survey are based on 3,502 usable responses to about 13,000 questionnaires mailed by the ACS Department of Career Services to newly graduated chemists and chemical engineers living in the U.S. Of the responses, 2,410 were from

Job market for 2000 grads

More chemistry and chemical engineering graduates are taking full-time jobs

EMPLOYMENT STATUS	BACHELOR'S			MASTER'S			PH.D.		
	1998	1999	2000	1998	1999	2000	1998	1999	2000
CHEMISTS									
Full-time permanent	35.8%	35.9%	35.4%	49.4%	52.8%	56.2%	44.4%	42.7%	45.3%
Full-time temporary	9.9	9.8	8.8	6.6	6.7	5.9	3.5	6.1	4.7
Graduate and professional school	42.9	43.5	45.8	34.4	31.3	27.4	—	—	—
Postdoc	—	—	—	—	—	—	45.3	45.5	41.1
Part-time permanent	0.6	0.8	0.8	0.9	0.2	1.4	0.5	0.3	0.0
Part-time temporary	2.6	2.7	2.0	1.3	2.0	2.7	1.3	1.2	1.1
Not employed but seeking employment	5.7	4.8	4.3	5.1	5.2	4.1	2.5	2.4	2.6
Not employed and not seeking employment	2.6	2.4	2.8	2.3	1.7	2.3	2.4	1.8	5.3
CHEMICAL ENGINEERS									
Full-time permanent	71.3%	71.0%	72.9%	61.1%	64.1%	68.1%	69.7%	69.8%	73.1%
Full-time temporary	4.2	4.4	2.5	1.4	2.4	0.0	2.3	1.6	1.9
Graduate and professional school	12.9	15.0	16.9	27.8	26.5	25.3	—	—	—
Postdoc	—	—	—	—	—	—	23.5	21.9	16.7
Part-time permanent	0.3	0.4	0.1	0.0	0.6	0.0	0.0	0.5	0.9
Part-time temporary	1.7	0.9	0.8	1.4	0.0	0.0	0.8	1.6	0.0
Not employed but seeking employment	8.1	7.5	5.5	5.6	5.3	3.3	3.0	2.1	2.8
Not employed and not seeking employment	1.4	0.8	1.3	2.8	1.2	3.3	0.8	2.6	4.6

More women

Bachelor's chemistry class is now more than 50% women

	CHEMISTS			CHEMICAL ENGINEERS		
	BACHELOR'S	MASTER'S	PH.D.	BACHELOR'S	MASTER'S	PH.D.
GENDER						
Male	48.1%	52.3%	64.7%	59.8%	67.8%	67.0%
Female	51.9	47.7	35.3	40.2	32.2	33.0
CITIZENSHIP						
U.S. native	87.8%	66.2%	70.5%	89.0%	61.5%	61.1%
Naturalized	7.8	11.4	4.7	6.8	9.9	7.4
Permanent resident	3.5	6.8	4.2	2.5	0.0	8.3
Temporary visa	1.0	15.5	20.5	1.8	28.6	23.1
RACE						
White	79.3%	69.7%	76.7%	76.1%	65.6%	63.8%
Asian	9.7	22.9	17.5	12.6	26.7	28.6
Black	4.6	3.2	3.2	5.4	2.2	2.9
American Indian	0.5	0.0	0.5	0.5	0.0	0.0
Other	5.9	4.1	2.1	5.4	5.6	4.8
ETHNICITY						
Hispanic	6.3%	5.9%	2.6%	6.1%	5.5%	3.8%

chemists; 1,092 from chemical engineers.

Problems with the Committee on Professional Training's (CPT's) computer-based process for acquiring and handling the addresses of graduates delayed the mailing of the questionnaires for the 1999–2000 survey. This contributed to the unusually low 27% response rate. The previous survey (C&EN, March 13, 2000, page 12) garnered 4,594 responses from chemists and 1,734 from chemical engineers for a more typical overall response rate of 43%.

Chemists' addresses are obtained from the academic departments approved by CPT. For chemical engineers, they are requested from departments approved by the American Institute of Chemical Engineers and the Engineer's Council for Professional Development.

The survey itself was supervised by senior research analyst Mary W. Jordan of the ACS Department of Career Services, who also supervises the membership surveys.

The demographics of the graduates responding show a continuation of the drift in the gender profile of the chemical profession with a majority, 52%, of bachelor's level chemistry graduates being women. This is up from 49% the previous year. At the master's level, 48% are women, up from 44%. And of new doctoral chemists, 35% are women, up from 33%.

Women have also achieved deep penetration into chemical engineering, with 40% of bachelor's degree respondents being women as well as 32% of master's graduates and 33% of doctorates.

Of all 1999–2000 chemistry graduates, 12% were Asian, as were 15% of all chemical engineering graduates. Fewer than 0.5% of either class were American Indians. Blacks made up about 4% of the

chemistry class and about 5% of the chemical engineers. In answer to a separate question, 6% of all graduates identified themselves as Hispanic.

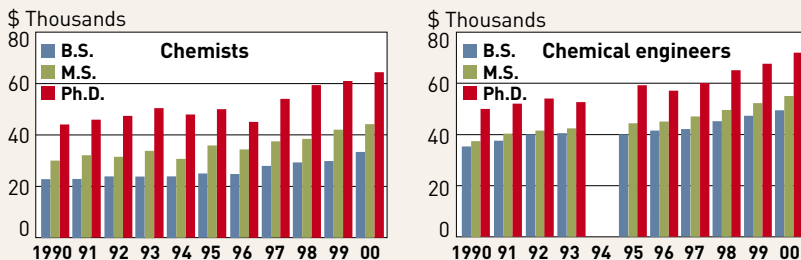
These very low levels of black and Hispanic participation in chemistry at the entry level still represent progress of sorts, because they exceed the participation of these groups in the total chemical workforce, which is today 1.9% black and 2.6%

Hispanic. Blacks and Hispanics each represent about 13% of the total U.S. population and an even higher percentage of younger adults.

SALARIES. Because the salaries that new graduates report to ACS each year are as of a specific date, they are not necessarily actual starting salaries. Some respondents will have been in their jobs long enough to have had

BETTER PAY

Salaries for new Ph.D. chemistry graduates are up more than 40% over the past four years



NOTE: Median starting salaries of graduates with full-time permanent employment and less than one year of technical work experience prior to graduation; 1994 data for chemical engineers are not available.

Certification

ACS-certified chemists are more likely to go to graduate school

% OF RESPONDENTS	BACHELOR'S DEGREE CERTIFIED BY ACS		ALL BACHELOR'S DEGREES BY TITLE	
	YES	NO	B.A.	B.S.
Full-time permanent	34.8%	35.8%	34.6%	35.7%
Full-time temporary	8.2	9.2	9.7	8.5
Part-time permanent	0.6	0.9	1.2	0.7
Part-time temporary	1.6	2.3	2.7	1.7
Graduate school ^a	49.0	43.6	46.9	45.5
Not employed but seeking employment	3.2	5.1	2.3	5.1
Not employed and not seeking employment	2.6	3.0	2.7	2.9

^a Includes postdocs.

Work experience

Earlier professional work boosts pay of chemistry graduates

\$ THOUSANDS	BACHELOR'S			MASTER'S			PH.D.		
	1998	1999	2000	1998	1999	2000	1998	1999	2000
CHEMISTS									
Work experience									
Less than 12 months	\$29.5	\$30.0	\$33.5	\$38.5	\$42.0	\$44.1	\$59.3	\$61.0	\$64.5
12-36 months	30.9	32.5	34.0	40.0	44.1	42.0	60.0	55.5	64.0
More than 36 months	35.0	39.0	40.0	40.0	47.0	49.5	58.6	64.0	68.5
ALL	30.0	31.0	34.0	40.0	43.1	45.0	59.7	60.5	65.0
CHEMICAL ENGINEERS									
Work experience									
Less than 12 months	\$45.0	\$47.0	\$49.4	\$49.5	\$52.0	\$55.0	\$65.0	\$67.7	\$72.0
12-36 months	45.4	48.0	50.7	52.1	55.0	55.2	67.5	68.8	73.0
More than 36 months	45.0	47.1	50.0	52.0	60.0	60.5	68.5	69.0	72.5
ALL	45.0	47.1	50.0	50.5	54.0	56.7	66.0	68.0	72.0

NOTE: Median starting salaries for graduates with full-time permanent employment.

a raise prior to the date—as noted, the week of Oct. 9, 2000, for the latest survey. And some respondents have accumulated considerable technical work experience—with their current employer or elsewhere—before receiving their latest degree.

To come to grips with these complexities, salary medians are reported for all respondents and, separately, for inexperienced graduates with less than 12 months of technical work experience; for

those with 12 to 36 months of experience; and for those with more than 36 months.

Because of the relatively low number of respondents to the latest survey and the unusually low response rate, the year-to-year median salary gains deduced from it should be regarded with some caution—especially the 12% surge for bachelor's degree chemists. However, the year-to-year increases are large enough and pervasive enough to leave no doubt that 1999–2000

chemistry and chemical engineering graduates did well in finding jobs that paid well by historic standards.

Such substantial growth in the salaries paid to new chemistry graduates is by no means routine. For instance, the median salary of 1995–96 chemistry doctoral graduates was \$45,000. This was down from \$50,000 for the previous year and even below the \$46,000 median for 1990–91 graduates.

Gender equality

Apparent salary advantage for male chemists probably reflects the uncertainties of the polling process

\$ THOUSANDS	CHEMISTS			CHEMICAL ENGINEERS		
	BACHELOR'S	MASTER'S	PH.D.	BACHELOR'S	MASTER'S	PH.D.
Men	\$35.0	\$45.4	\$65.8	\$48.6	\$54.8	\$72.0
Women	32.0	42.3	64.4	50.0	57.0	72.0
ALL	33.5	44.1	64.5	49.1	55.0	72.0

NOTE: Median starting salaries for graduates with full-time permanent employment and less than 12 months of technical work experience prior to graduation.

Engineers have edge

High pay reflects acceptance of bachelor's chemical engineering degree as terminal degree

\$ THOUSANDS	CHEMISTS			CHEMICAL ENGINEERS		
	BACHELOR'S	MASTER'S	PH.D.	BACHELOR'S	MASTER'S	PH.D.
NATURE OF EMPLOYMENT						
Academic	\$28.5	—	—	—	—	—
Business/industry	34.0	\$45.0	\$68.5	\$50.0	\$56.7	\$72.0
Government/other	29.4	—	—	34.3	—	—
ALL	33.3	44.1	64.5	49.4	55.0	72.0

NOTE: Median starting salaries for graduates with full-time permanent employment and less than 12 months of technical work experience prior to graduation. Where no salary data are shown, sample set is too small (fewer than 15) to be meaningful.

How long it takes

Half of doctoral chemistry degrees are earned at or after age 30

	CHEMISTS			CHEMICAL ENGINEERS		
	BACHELOR'S	MASTER'S	PH.D.	BACHELOR'S	MASTER'S	PH.D.
Median age	23	28	30	23	26	29
Mean age	24	30	31	24	27	30
Minimum age	20	21	22	21	21	23
Maximum age	76	85	60	69	43	40

In fact, 1995 and 1996 were particularly bad years for the chemical profession—when it was moving countercurrent to the economic expansion that had started in 1993 and which was, by then, gathering a head of steam. These two years are the cusp of a phase change for chemistry as a profession during the past decade.

The first phase, from 1990 to 1996, was very tough, with annual increases in the salaries for graduates at all degree levels averaging about 1%, while inflation was growing at 3% per year.

The second phase, from 1996 to 2000 when inflation was down to about 2% per year, was one of catch-up, with average annual increases in the median salaries paid to new chemistry graduates each year of 8% for those with bachelor's degrees, 7% for those with master's degrees, and 9% for Ph.D.s. These gains were partly due to disproportionately large growth in availability of relatively higher paying jobs in industry.

Over the entire decade, the average annual increase in the salaries paid to chemistry graduates was slightly under 4% at all degree levels, about one percentage point higher than the inflation rate of 2.8%.

Chemical engineering graduate salaries showed the same pattern but in a more muted form. Their median salary gains averaged about 3% during the first phase and about 5% during the second. For the full decade, growth was the same as for chemists, with an average annual increase of close to 4%.

The impact of prior technical work experience on graduate salaries is considerable. The median salary of the 69% of bachelor's graduates with less than a year of experience was \$33,500. For the 10% with three or more years of work under their belts, it was \$40,000. For master's chemistry graduates, this differential was from \$44,100 to \$49,500 and for doctoral graduates, \$64,500 to \$68,500. In general, chemical engineering graduates have less prior work experience than chemists, and it has less impact on the salaries of those who do.

The salary data on inexperienced 1999–2000 graduates suggest that male chemists enjoyed an advantage—with a

\$35,000 to \$32,000 margin at the bachelor's level, a larger \$45,400 to \$42,300 advantage for master's, and an edge of \$65,800 to \$64,400 for new doctorates. However, these inequities are probably largely due to the uncertainties of the surveying process, uncertainties that are compounded as the number of respondents drops.

This persistent advantage for male chemists disappears when the salaries of all respondents, not just inexperienced ones, are considered. On this basis, women 1999–2000 chemistry doctoral graduates earned a smidgen more than their male counterparts, \$65,000 versus \$64,000, while master's graduates of both sexes posted a \$45,000 median. Men retained an apparent advantage at the bachelor's degree level, \$35,000 versus \$32,100.

It should also be noted that the median salaries of 1999–2000 inexperienced

women chemical engineering graduates equaled or slightly exceeded those for inexperienced male graduates at all three degree levels.

The salary advantage that chemical engineering graduates hold over chemistry graduates persists. For inexperienced bachelor's graduates it is \$49,400 versus \$33,500. For new doctorates it is \$72,000 versus \$64,500. These differences are apparently not due to age. Chemical engineers tend, if anything, to graduate sooner than chemists. For instance, the median age of new chemical engineering doctoral graduates is 29. For chemists, it is 30.

Two other factors that have a marked impact on the salaries of newly graduated bachelor's-level chemical professionals are the size of their employer and their grade point average.

According to the latest survey, new chemistry and chemical engineering bachelor's graduates working for firms with at least 25,000 employees had a median salary 20% higher than that of those taking jobs at small companies with fewer than 50 employees. And, in both fields, those with an A overall grade point average posted an initial 12% salary advantage over those with a C average.

EMPLOYMENT STATUS. The more practical, applied nature of chemical engineering as a profession, compared with more research-oriented chemistry, is illustrated clearly by the employment data. For instance, 73% of 1999–2000 bachelor's chemical engineering graduates obtained full-time permanent jobs while 17% continued their education in graduate or professional schools. For chemistry bachelor's graduates, 35% had such full-time jobs and 46% went on to graduate or professional schools. The situation is similar at the doctoral level, with 73% of chemical engineering graduates and 45% of chemistry graduates having full-time permanent jobs and 17% of chemical engineers and 41% of chemists on postdocs.

For chemical engineers, 92% of the full-time jobs taken at all three degree levels were in industry. For the chemist graduates, it was 80%. ■

Further studies

Relatively few bachelor's-level chemical engineers go to graduate school

% OF RESPONDENTS	FURTHER STUDY		
	YES		NO
	FULL TIME	PART TIME	
CHEMISTS			
Bachelor's	45.8%	6.3%	47.9%
Master's	27.4	7.8	64.8
CHEMICAL ENGINEERS			
Bachelor's	16.9	4.6	78.5
Master's	25.3	4.4	70.3

Grade point average

An A pays off in cash for new bachelor's graduates

OVERALL GRADE POINT AVERAGE	CHEMISTS	CHEMICAL ENGINEERS
A	\$35.0	\$52.0
A-	36.0	51.0
B	33.0	49.0
C	31.3	46.0

NOTE: Median starting salaries for graduates with full-time permanent employment and less than 12 months of technical work experience prior to graduation.

Where the money is

Big employers offer big salary advantage for new graduates

NUMBER OF EMPLOYEES	BACHELOR'S	
	CHEMISTS	CHEMICAL ENGINEERS
Fewer than 50	\$32.0	\$42.0
50 to 499	32.0	45.0
500 to 2,499	35.0	47.3
2,500 to 9,999	37.0	50.0
10,000 to 24,499	39.9	50.2
25,000 or more	40.1	51.0

NOTE: Median starting salaries in thousands of dollars for graduates with full-time permanent employment and less than 12 months of technical work experience prior to graduation.