



# 2003 STARTING SALARY SURVEY

## Full-time work was harder to find for 2002–03 chemistry graduates

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**C**HEMISTS WHO GRADUATED DURING the 2002–03 academic year can be congratulated for their accomplishment, but not for their timing. Last fall, they entered a job market that was still softened by a persistent inability of the economy—which has been growing in gross domestic product terms since late 2001—to consistently generate jobs in significant numbers.

This decoupling of economic growth from jobs growth was reflected in fewer full-time permanent jobs for chemistry graduates. It was also related to a spotty starting salary performance compared with the previous two graduating classes.

According to the latest annual American Chemical Society survey of the starting salaries and employment status of chemistry graduates, the median salary of inexperienced 2002–03 Ph.D. graduates was \$63,300. This was down from \$67,500 for the previous class and from the all-time high of \$69,500 for the 2000–01 class.

The survey also indicates that for inexperienced master's chemistry graduates,

there was a 2001–02 to 2002–03 salary dip from \$45,000 to \$44,500. For bachelor's graduates, the 2002–03 median of \$32,000 was up by \$1,000 from the previous year. But it remained below the all-time high of \$33,500 for the 2000 class.

Inexperienced graduates are defined as those with less than 12 months of technical work experience prior to graduation.

As to employment, 37% of 2002–03 chemistry Ph.D. graduates found full-time permanent jobs. This was down from 45% for the three previous classes. And over this same period from 1999–2000 to 2002–03, the corresponding declines have been from 35% to 24% for bachelor's graduates and from 56% to 41% for master's graduates.

**THE SURVEY.** This year's survey was based on questionnaires mailed to 8,876 chemistry 2002–03 graduates for whom addresses were available. The total number of chemistry 2002–03 graduates at all three degree levels was about 13,500. The questionnaire was also sent to 1,760 chemical

engineering graduates. Of this total of 10,363 questionnaires, 9,792 went to good addresses. The total response was 3,500, a response rate of almost 36%. The questionnaire asked for data as of the week of Oct. 6, 2003.

Most of the chemists polled were graduates from the more than 600 institutions with undergraduate programs approved by ACS's Committee on Professional Training (CPT). An additional 400 questionnaires were sent to graduates from non-CPT schools. In all, 3,000 chemists responded. The other 500 responses were chemical engineering graduates from departments accredited by the American Institute of Chemical Engineers and the Accreditation Board for Engineering & Technology.

Research Associate Janel Kasper-Wolfe of ACS's Department of Career Services conducted this year's survey. Both this survey and ACS's annual salary and employment survey of ACS members in the domestic workforce (C&EN, Aug. 4, 2003, page 37) are under the general guidance of the Committee on Economic & Professional Affairs.

Women graduates were considerably more responsive to the survey than were men. Of the questionnaires sent to bachelor's graduates, 49.7% went to women, who accounted for 57.0% of the responses. At the Ph.D. level, the 32.7% of questionnaire recipients who were women accounted for 44.6% of the responses. For master's graduates, 45.7% of recipients and 55.1% of respondents were women.

In most cases, the overrepresentation of women among respondents does not significantly distort the overall data derived from analysis of the responses. This is because, for most of the parameters measured, there were not major differences between men and women.

**SALARIES.** The big drop in median starting salaries for 2003 Ph.D. chemistry graduates with full-time jobs was not unprecedented. It confirms the sensitivity of such salaries to the supply/demand balance. For instance, 1996, the third year of the longest and strongest economic boom in U.S. history, was a surprisingly weak year for chemists' employment. The median salary of Ph.D. graduates tumbled to \$45,000 from \$50,000 the previous year.

To put the best possible spin on all this, the 1996 decline was followed by five years of strong salary growth, averaging 9% annually. This ended with the \$69,500 high in 2001, which came just as the boom finally ran out of steam.

Over the decade from 1993 to 2003,

## SALARIES OF NEW CHEMISTRY GRADS

Some slippage has occurred over the past two years

\$ THOUSANDS	B.A./B.S.	M.S.	PH.D.
1993	\$24.0	\$34.0	\$50.4
1994	24.0	30.8	48.0
1995	25.0	36.0	50.0
1996	25.0	34.1	45.0
1997	28.0	37.5	54.0
1998	29.5	38.5	59.3
1999	30.0	42.0	61.0
2000	33.5	41.1	64.5
2001	32.2	43.0	69.5
2002	31.0	45.0	67.5
2003	32.0	44.5	63.3

**NOTE:** Median annual salaries as of October of each year for new graduates with full-time permanent employment and less than 12 months of technical work experience prior to graduation.

median starting salaries for inexperienced chemists rose by 33% for bachelor's chemists, 31% for master's, and 26% for Ph.D.s. Essentially all of these gains came after 1996.

The two major factors that affect the starting salaries of chemists, apart from

supply and demand, are prior working experience and the nature of the employer.

The median salaries for 2003 graduates with three years or more of technical work experience prior to graduation were \$39,000 for bachelor's, \$54,000 for master's, and \$77,500 for Ph.D.s. Not surprisingly, these are all substantially more than the medians of \$32,000, \$44,500, and \$63,300, respectively, for inexperienced graduates.

In 2003, Ph.D. graduates taking full-time permanent jobs in industry had a median salary of \$73,000. This showed the usual big advantage for Ph.D. chemists in industry over the median for academic jobs, which was \$42,000. The median for government jobs was somewhere between the two, but closer to the industry level.

This big differential between academic and industrial salaries, combined with relatively more male graduates finding industrial jobs than women do, 66% versus 52%, and relatively fewer men than women taking lower paying academic positions, 30% versus 42%, accounts mathematically for most of the apparent overall salary ad-

## SALARIES BY GENDER

Results are somewhat uneven, but show no overall advantage for men

	B.A./B.S.			M.S.			PH.D.		
	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL
Academia	\$30.3	\$30.0	\$30.0	—	\$36.0	\$36.1	\$41.0	\$42.0	\$41.5
Manufacturing	38.0	36.6	37.0	\$59.8	50.7	54.0	75.0	80.0	76.0
Nonmanufacturing	31.0	30.0	30.0	—	—	50.0	78.0	—	75.0
Government/other	35.5	32.3	33.0	—	—	—	—	—	—

**NOTE:** Median annual salaries as of the week of Oct. 6, 2003, of graduates with less than 12 months of technical work experience prior to graduation. Where no salaries are shown, data are inadequate to be meaningful.

## JOB MARKET

Percentage of graduates finding full-time permanent employment has dipped

EMPLOYMENT STATUS	B.A./B.S.				M.S.				PH.D.			
	2000	2001	2002	2003	2000	2001	2002	2003	2000	2001	2002	2003
Full-time												
Permanent	35%	31%	26%	24%	56%	49%	38%	41%	45%	45%	45%	37%
Temporary	9	9	10	9	6	6	5	6	5	3	6	5
Part-time												
Permanent	1	1	1	2	1	2	1	2	0	0	0	1
Temporary	2	3	6	6	3	4	2	5	1	1	2	2
Graduate/professional school	46	47	47	49	27	33	47	33	—	—	—	—
Postdoctoral	—	—	—	—	—	—	—	—	41	44	40	51
Not employed												
Seeking	4	6	6	7	5	5	5	10	3	3	5	4
Not seeking	3	3	5	3	2	1	3	3	5	4	3	1

**NOTE:** Employment status of new chemistry graduates as of early October each year.

## DEMOGRAPHICS

Noncitizens earn one-third of 2003 chemistry Ph.D.s

	B.A./B.S.	M.S.	PH.D.
<b>CITIZENSHIP</b>			
U.S. native born	89.9%	63.0%	62.1%
Naturalized	5.7	7.6	3.3
Permanent resident	3.2	7.3	7.9
Temporary visa	1.1	22.1	26.6

	B.A./B.S.	M.S.	PH.D.
<b>RACE</b>			
White	80.6	61.5	67.7
Asian	9	23.5	24.1
Black	5.1	7.7	3.3
American Indian	0.6	1.5	0.3
Other	4.6	5.8	4.6

	B.A./B.S.	M.S.	PH.D.
<b>ETHNICITY</b>			
Hispanic	3.8	6.9	3.6

## AGE AT GRADUATION

For some, a chemistry degree is a long-sought goal

AGE AT GRADUATION	B.A./B.S.	M.S.	PH.D.
Median	23	28	30
Mean	24	30	31
Minimum	20	22	26
Maximum	62	75	72

## RESPONDENTS BY GENDER

Women were considerably more likely to respond to the survey

	B.A./B.S.	M.S.	PH.D.
<b>THOSE SENT THE QUESTIONNAIRE</b>			
Men	50.3%	54.3%	67.3%
Women	49.7	45.7	32.7

**THOSE WHO RETURNED THE QUESTIONNAIRE**

	B.A./B.S.	M.S.	PH.D.
Men	43.0	44.9	55.4
Women	57.0	55.1	44.6

vantage for men Ph.D. graduates of \$66,500 versus \$55,000 for women.

The direct comparison of the median salaries of inexperienced women and men Ph.D. graduates with jobs in academia actually shows a slight advantage for women: \$42,000 compared with \$41,000. For jobs in manufacturing, the salaries are \$80,000 for women and \$75,000 for men.

Over the years, newly graduated chemistry Ph.D.s have consistently earned about twice as much as newly graduated bachelor's. However, Ph.D. graduates are, on average, about seven years older than B.S. graduates, which accounts for much of the difference. B.S. graduates in the workforce in March last year who were between five

## CHEMICAL ENGINEERING GRADS

# Industry-Oriented Chemical Engineers Retain Salary Advantage

It has long been established that chemical engineering graduates are generally better paid than chemistry graduates and more likely to work for industry.

This situation is certainly true for the 2003 class, with a median starting salary for inexperienced chemical engineering bachelor's graduates of \$52,000. This salary is a full \$20,000 higher than the \$32,000 median for inexperienced chemistry bachelor's graduates and reflects the much wider acceptance of the chemical engineer-

ing bachelor's degree as a terminal, professional qualification.

The salary advantage for chemical engineering over chemistry graduates is smaller at the higher degrees. The salaries are, respectively, \$55,000 versus \$44,500 for master's graduates and \$72,000 versus \$63,300 for Ph.D.s. These differences are substantially due to the higher percentages of chemical engineering graduates with industry jobs: 79% versus 62% for master's graduates and 77% versus 60% for Ph.D. graduates.

### STARTING SALARIES

Bachelor's degrees in chemical engineering are more highly valued than degrees in chemistry

MEDIAN SALARY,			
\$ THOUSANDS	B.A./B.S.	M.S.	PH.D.
Chemists	\$32.0	\$44.5	\$63.3
Chemical engineers	52.0	55.0	72.0

NOTE: Median salaries of 2002-03 graduates working full time and having less than 12 months of technical work experience prior to graduation.

and nine years beyond their bachelor's degree had a median salary of \$50,000, or almost 80% of the median salary for 2003 Ph.D. graduates, according to ACS's latest survey of its members.

One salary that has been increasing in recent years is that of chemistry postdocs. For them, the median for 2003 was \$34,000. This was up from \$29,000 in 2000, \$31,000 in 2001, and \$33,000 in 2002.

**EMPLOYMENT.** A positive sign from the employment data for 2003 chemistry graduates is that the number of bachelor's and Ph.D. graduates unemployed, but seeking employment, held at reasonably low levels. For bachelor's graduates, this number moved up a bit from 6% for the 2002 class to 7%, while for Ph.D. graduates, it fell a notch from 5% to 4%. This stability probably reflects the ability of graduate school and postdoc positions to absorb, at least temporarily, any potential surplus of graduates. In 2003, 43% of those on postdocs indicated they held their positions because they could not find full-time employment.

For bachelor's graduates, the percentage with permanent or temporary full-time jobs slipped from 36% for the 2002 class to 33%, while the number in graduate or professional school edged up from 47% to 49%. For Ph.D.s, the drop in those with full-time employment was sharper—from 51% to 42%—and the number of postdocs surged from 40% to 51%.

The 2003 data for master's graduates, the smallest and so most volatile cohort, are harder to interpret. They show a spike in involuntary unemployment to 10% from 5% a year earlier. They also show an increase in full-time employment, both temporary and permanent, from 43% to 47%

and a decline in those in graduate or professional school from an inexplicably high 47% in 2002 to 33%, the same as in 2001.

Compared with the chemists already in the workforce, as measured by the 2003 ACS member survey, new graduates are

### SALARIES BY EXPERIENCE

Earlier work experience added about \$8,000 to salaries on graduation in 2003

\$ THOUSANDS	B.A./B.S.			M.S.			PH.D.		
	2001	2002	2003	2001	2002	2003	2001	2002	2003
Less than 12 months	\$32.2	\$31.0	\$32.0	\$43.0	\$45.0	\$44.5	\$69.5	\$67.5	\$63.3
12-36 months	36.0	34.1	35.0	49.1	41.0	45.0	63.0	65.0	72.5
More than 36 months	36.7	40.0	39.0	50.0	55.0	54.0	74.0	70.0	77.5
<b>ALL</b>	<b>\$33.6</b>	<b>\$32.8</b>	<b>\$33.0</b>	<b>\$48.0</b>	<b>\$50.0</b>	<b>\$48.0</b>	<b>\$70.0</b>	<b>\$68.0</b>	<b>\$68.5</b>

NOTE: Median salaries as of early October of each year.

### SALARY-JOB CONNECTION

Men master's and Ph.D. graduates are more likely to work for industry ...

	B.A./B.S.			M.S.			PH.D.		
	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL
In academia	24%	21%	23%	21%	37%	30%	30%	42%	35%
In industry	64	67	66	70	57	62	66	52	60
Government/other	12	12	12	9	6	7	4	6	5

... where salaries are much higher than in academia ...

\$ THOUSANDS	B.A./B.S.		M.S.		PH.D.	
	2002	2003	2002	2003	2002	2003
Academia	\$28.6	\$30.0	—	\$36.3	\$39.7	\$42.0
Business/industry	32.0	33.0	\$45.0	50.2	71.0	73.0
Government/other	33.2	32.7	—	—	—	—
<b>ALL</b>	<b>\$31.0</b>	<b>\$32.0</b>	<b>\$45.0</b>	<b>\$44.5</b>	<b>\$67.0</b>	<b>\$63.3</b>

... producing an apparent salary advantage for men

\$ THOUSANDS	B.A./B.S.	M.S.	PH.D.
All men	\$32.0	\$47.6	\$66.5
All women	32.0	43.0	55.0
<b>ALL</b>	<b>\$32.0</b>	<b>\$44.5</b>	<b>\$63.3</b>

NOTE: All data are as of the week of Oct. 6, 2003. Salaries are median annual salaries of graduates with full-time permanent employment and less than 12 months of technical work experience prior to graduation. Where no salaries are shown, data are inadequate to be meaningful.

**WHERE THE JOBS ARE**

New graduates are less likely than ACS members to work in manufacturing

	2002-03 GRADUATES	ALL ACS MEMBERS IN 2003 WORKFORCE
<b>MANUFACTURING</b>	44%	54%
Chemical & related	10	15
Pharmaceutical & related	23	21
Other manufacturing	11	18
<b>ACADEMIA</b>	24	26
University/four-year college	10	20
Medical/professional schools	4	2
Two-year colleges	1	2
Elementary/secondary schools/other	9	2
<b>OTHER</b>	32	20
Analytical/research services	15	9
Government	8	8
Self-employed	1	1
Other	8	3

**NOTE:** Values are percentages of chemists at all degree levels with full-time permanent employment. Data on ACS members in the workforce are from the 2003 salary and employment survey of ACS members (C&EN, Aug. 4, 2003, page 37).

less likely to have jobs in manufacturing: 44% of graduates compared with 54% of chemists in the workforce. Both chemists in the workforce and new graduates are about equally likely to be in academia, about 25%. But new graduates are less likely to be in universities or four-year colleges, 10% of graduates compared with 20% of those in the workforce, and more likely to be in elementary, secondary, or other schools, 9% compared with 2%.

The biggest difference is in the nonacademic, nonmanufacturing category that claims 32% of new graduates and 20% of the workforce. This category includes analytical and research services, with 15% of graduates but only 9% of the workforce.

The issue that transcends the employment situation for any group today is the unprecedented hiatus in the growth of the number of people on nonfarm payrolls. This hiatus is now in its 36th month, and payrolls are still 2 million lower than they were in early 2002. Previous such pauses in job

growth since World War II have lasted an average of about 24 months.

According to the Bureau of Labor Statistics, payrolls in the U.S. peaked at 132.5 million in March 2001. The low of 129.8 million came in August of 2003. Since then there has been an increase to 130.5 million, with a sudden upsurge of 300,000 last month (C&EN, April 12, page 16).

Much of the job loss since 2001 has been in manufacturing. This is a particular concern for chemists, many of whom are on the payrolls of companies that manufacture products.

Another negative marker for chemists is the disturbing number of college graduates of all types who are unemployed. In

**FURTHER STUDIES: PARTICIPATION**

Slightly more men graduates continue with studies

	B.A./B.S.			M.S.		
	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL
<b>YES</b>						
Full time	50%	48%	49%	35%	30%	32%
Part time	5	4	4	4	5	5
<b>NO</b>	45	48	47	61	65	63

**NOTE:** Full-time advanced studies of new chemistry graduates as of fall 2003.

**FURTHER STUDIES: BY TOPIC**

Goodly number of bachelor's degree chemists move on to medicine

	B.A./B.S.	M.S.
<b>SCIENCE</b>		
Chemistry	39.9%	72.1%
Pharmacology	7.5	2.3
Biochemistry	7.1	7.0
Life sciences	4.4	—
Other physical sciences/math	1.9	—
<b>ENGINEERING</b>		
Chemical/biochemical engineering	1.7	2.3
Other engineering	1.1	—
<b>HEALTH</b>		
Medicine	23.5	4.7
Dentistry	3.8	1.2
<b>OTHER</b>		
Education	2.6	2.3
Business management	0.7	2.3
Law	1.2	2.3
Other	4.5	3.5

**NOTE:** Full-time advanced studies of new chemistry graduates as of fall 2003. Where no percentages are shown, data are inadequate to be meaningful.

March this year, this number was 1.17 million, more than twice the 560,000 unemployed at the end of 2000.

Generally, 2003 chemistry graduates were happy with the employment they found. More than 90% of the Ph.D. respondents agreed that their jobs were related to their fields, commensurate with their training, and challenging. For bachelor's and master's graduates, these scores were between 74% and 88%. Agreement that jobs were "what was expected" ranged from 63% for bachelor's graduates, 73% for master's, and 65% for Ph.D.s.

**OTHER TOPICS.** Questions about advanced study indicate that 53% of bachelor's and 37% of 2003 master's chemistry graduates were involved in advanced study last fall, either full time or part time. Distribution by topic is more diverse for the bachelor's: 40% continue in chemistry, 21% in other sciences or mathematics, 27% in medicine or dentistry, and 12% in other fields. For master's, 72% are in chem-

**EVALUATION OF JOB**

Ph.D. graduates are happiest in their work, even if it's not always what was expected

MY JOB IS	B.A./B.S.		M.S.		PH.D.	
	AGREE	DISAGREE	AGREE	DISAGREE	AGREE	DISAGREE
Related to my field	82%	16%	88%	8%	94%	6%
Commensurate with training	77	17	74	20	92	4
Challenging	74	19	81	14	90	4
What I expected when I began my studies	63	24	73	21	65	23

**NOTE:** There is also a neutral option.

istry, 9% in other sciences, 6% in medicine or dentistry, and 13% in other fields.

The breakdown of 2003 chemistry Ph.D. graduates by discipline and subdiscipline reveals 78% as being in the classic subdisciplines, 13% in biochemistry, and 9% in other fields. Most 2003 bachelor's degrees were in general chemistry—62%—and another 26% were in biochemistry.

Breakdowns by gender generally revealed little difference, but there were exceptions. Organic chemistry claimed 39% of the male Ph.D. graduates but only 23% of the women. Conversely, 24% of the Ph.D.s earned by women were in analytical chemistry compared with only 14% of the male graduates.

**OVERALL TRENDS.** Compared with quickie national public opinion surveys that are usually based on about 1,000 responses, the 3,000 responses to this ACS survey of a total population of about 13,500 chemistry graduates represent a respectably large sample.

However, once these 3,000 responses start to get sliced up by degree, gender, amount of pregraduation experience, type

## FIELD OF DEGREES

More than a quarter of bachelor's graduates identify themselves as biochemists

	B.A./B.S.			M.S.			PH.D.		
	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL
General chemistry	61.7%	61.3%	61.5%	16.8%	18.6%	17.8%	1.4%	3.4%	2.3%
Classic chemistry									
Analytical	6.3	5.2	5.6	63.1	61.5	62.2	80.6	75.5	78.3
Inorganic	1.9	2.2	2.1	17.6	16.6	17.0	14.4	24.0	18.7
Medical/pharmaceutical	0.5	0.4	0.4	7.6	8.3	8.0	10.6	12.0	11.3
Organic	0.2	0.8	0.5	2.5	2.8	2.7	1.4	0.0	0.8
Physical	2.9	1.2	1.9	31.1	24.1	27.3	38.9	22.9	31.7
Biochemistry	0.8	0.6	0.7	4.2	9.7	7.2	15.3	16.6	15.9
Other									
Biochemistry	24.4	27.8	26.4	10.9	13.1	12.1	11.1	15.4	13.0
Other	7.5	5.8	6.6	9.1	6.9	8.0	7.0	5.6	6.5

**NOTE:** Other includes agricultural and food chemistry, chemistry education, environmental chemistry, materials science, polymer chemistry, and others.

of employer, and other parameters, response numbers start to become quite small.

This means that—although the survey yields a reasonably accurate measure of overall trends—year-to-year changes from one survey to the next for subsets of the population can become irregular and jerky. An example is the previously noted apparent huge drop in the percentage of master's graduates who are currently en-

rolled in graduate or professional school.


The bottom line is that, over the past two or three years, chemistry graduates responding to the ACS survey have not endured any pervasive collapse of their employment and professional prospects. But they have encountered a softening demand for their services, especially in industry, and this situation has, in turn, somewhat dampened their salaries. ■

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