

CLASS OF 2006 SALARIES AND JOBS

Job situation for 2006 **CHEMISTRY GRADUATES** was not too bad, but salaries for new Ph.D.s stumbled

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THE LATEST annual survey of the employment status and salaries of new chemistry graduates by the American Chemical Society reveals a mixed picture. The job situation for 2006 graduates remained reasonably good and largely unchanged from what it had been for the two previous graduating classes. But at all three degree levels, full-time jobs remained less plentiful than they had been for graduates during the second half of the booming 1990s.

The median salaries for the 2006 class were markedly mixed. The median for inexperienced bachelor's graduates with full-time permanent employment and less than 12 months of technical work prior to graduation remained unchanged at \$35,000.

Master's graduates posted a \$2,400, or 5%, one-year gain to \$47,400. According to the survey, the median salary for Ph.D. graduates tumbled to \$60,000 from \$72,400 for 2005 graduates for a surprisingly large, and not readily explained, decline of 17%.

Two-year salary changes for bachelor's and master's graduates were somewhat nearer the norm. Salaries for 2006 bachelor's graduates were 8% higher than they had been for 2004 graduates. For master's graduates, the gain was 9%. And Ph.D. graduates posted a less alarming 8% two-year decline.

Starting-salary surveys are based on questionnaires sent to graduates from academic departments with ACS-approved undergraduate chemistry programs, as well as graduates from chemical engineering departments at the same schools. The addresses of graduates are gathered and provided by ACS's Office of Professional Training. The questionnaires ask for data as of early October each year.

There were just over 2,400 usable responses from chemists and 400 from chemical engineers to the 2005-06 survey. Those responding represented about 16% of all chemistry graduates and about 7% of all chemical engineering graduates.

The response rate to the survey has been

declining for many years. The same is happening to ACS's annual survey of salary and employment status of its members in the domestic workforce.

As recently as the starting-salary survey of 1998 graduates, there were close to 6,000 responses, 4,800 from chemistry graduates and close to 1,100 from chemical engineering graduates.

The declining response rate enhances the need to interpret survey results with increasing care. For instance, the low response from chemical engineers to the starting-salary survey limits the amount of meaningful analysis that is possible.

The falling response rate may also have something to do with the recent gyrations in the salaries for Ph.D. chemistry graduates. As total response declines, responses from subsets of the population—such as Ph.D. graduates with full-time permanent employment and less than 12 months of technical work experience prior to graduation—get quite small in absolute terms, 74 in this case. This makes the findings increasingly vulnerable to random variations.

Another contributor to the apparent large 2005-06 drop in Ph.D. salaries is the very high value reported for 2005 gradu-

EMPLOYMENT STATUS

Job situation for chemistry graduates has not changed much for past three years

	1998	1999	2000	2001	2002	2003	2004	2005	2006
BACHELOR'S									
Full-time	46%	46%	44%	40%	36%	33%	35%	36%	39%
Permanent	36	36	35	31	26	24	25	27	30
Temporary	10	10	9	9	10	9	10	9	9
Part-time	3	4	3	4	7	8	5	5	4
Permanent	1	1	1	1	1	2	1	1	1
Temporary	2	3	2	3	6	6	4	4	3
Graduate/professional school	43	43	46	47	47	49	49	47	47
Not employed	8	7	7	9	11	10	11	12	10
Seeking	5	5	4	6	6	7	7	8	6
Not seeking	3	2	3	3	5	3	4	4	4
MASTER'S									
Full-time	56	60	62	55	43	47	53	48	50
Permanent	49	53	56	49	38	41	48	45	42
Temporary	7	7	6	6	5	6	5	3	8
Part-time	2	2	4	6	3	7	5	10	5
Permanent	1	0	1	2	1	2	2	1	0
Temporary	1	2	3	4	2	5	3	9	5
Graduate/professional school	35	31	27	33	47	33	32	30	35
Not employed	7	7	7	6	8	13	11	12	10
Seeking	5	5	5	5	5	10	7	9	6
Not seeking	2	2	2	1	3	3	4	3	4
PH.D.									
Full-time	48	49	50	48	51	42	39	38	37
Permanent	44	43	45	45	45	37	37	34	33
Temporary	4	6	5	3	6	5	2	4	4
Part-time	2	2	1	1	2	3	1	2	2
Permanent	1	0	0	0	0	1	0	0	1
Temporary	1	2	1	1	2	2	1	2	1
Postdoc	45	45	41	44	40	51	52	51	52
Not employed	5	4	8	7	8	5	8	9	9
Seeking	3	2	3	3	5	4	5	5	6
Not Seeking	2	2	5	4	3	1	3	4	3

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

ates. For the past three surveys, the median full-time salaries for inexperienced Ph.D. graduates have been \$65,000, \$72,400, and \$60,000. Another factor is that a high 52% of 2006 graduates took relatively low-paying jobs in academia.

The survey of 2006 graduates was conducted by Gareth S. Edwards of ACS's Department of Member Research & Technology. Both this survey and the annual salary and employment survey are conducted under the guidance of the ACS Committee on Economic & Professional Affairs.

A SLIGHT MAJORITY, 52%, of both bachelor's- and master's-degree graduates responding to the latest survey were women, as were 31% of the Ph.D. graduates. By race, Asians, about 4% of the U.S. population, earned 10% of the bachelor's degrees, 24% of the master's degrees, and 28% of the Ph.D.s. African Americans, about 14% of the population, were grossly underrepresented with about 4% of the degrees overall. Hispanics, also about 14% of the population, accounted for just 5% of the total graduates.

Those who are not U.S. citizens—permanent residents and those on temporary visas—claimed 34% of the Ph.D.s, 23% of the master's degrees, and 4% of the bachelor's degrees. A large percentage of these graduates were from Japan, China, India, South Korea, and other Asian nations.

The median age at graduation was 23 years for bachelor's graduates, 27 for master's graduates, and 31 for Ph.D.s.

A little more than 61% of the 2006 bachelor's degrees were in general chemistry. Another 4% were in the classic subdisciplines of analytical, inorganic, organic, physical, and polymer chemistry. The remaining 34% were in chemistry-related disciplines such as biochemistry and chemical education. Of the Ph.D. degrees, 5% were in general chemistry, 72% in the classic subdisciplines, and 23% in the chemistry-related category.

Of the bachelor's chemistry graduates responding to the 2006 survey, 43% reported having full-time or part-time jobs, either permanent or temporary. This was down from the recent high of 50% of 1999 graduates. For master's graduates, the parallel decline was from a high 66% of 2000 graduates to 55% of 2006 graduates. For Ph.D. graduates, the decline was even larger, from 51% of the 2000 class to 39% of the 2006 class.

The percentage of graduates not working—either by choice or involuntarily—has trended upward a little between 2000 and 2006. For both bachelor's and master's graduates, it has risen from 7% to

10% and, for Ph.D.s, from 8% to 9%. Since the 2003 class, between 51 and 52% of new Ph.D. chemistry graduates have taken postdocs, while about 48% of bachelor's graduates and 33% of master's graduates

SALARIES OF INEXPERIENCED CHEMISTRY GRADS

Except for an apparent big drop for Ph.D.s, constant-dollar pay has been fairly stable since 2000

\$ THOUSANDS	B.A./B.S.		M.S.		PH.D.	
	CURRENT	CONSTANT	CURRENT	CONSTANT	CURRENT	CONSTANT
1996	\$25.0	\$32.1	\$34.1	\$43.8	\$45.0	\$57.8
1997	28.0	35.2	37.5	47.1	54.0	67.8
1998	29.5	36.5	38.5	47.6	59.3	73.4
1999	30.0	36.3	42.0	50.8	61.0	73.8
2000	33.5	39.2	41.1	48.1	64.5	75.5
2001	32.2	36.6	43.0	48.9	69.5	79.1
2002	31.0	34.7	45.0	50.4	67.5	75.6
2003	32.0	35.1	44.5	48.8	63.3	69.4
2004	32.5	34.7	43.6	46.5	65.0	69.4
2005	35.0	36.1	45.0	46.4	72.4	74.7
2006	35.0	35.0	47.4	47.4	60.0	60.0

NOTE: Data are median annual salaries of new chemistry graduates with full-time permanent employment and less than 12 months of technical work experience prior to graduation as of early October each year. Current dollars are for referenced year. Constant dollars are 2006 dollars.

STARTING SALARIES BY WORK EXPERIENCE

Early work experience had varied impact on pay for 2006 chemistry graduates

\$ THOUSANDS	B.A./B.S.			M.S.			PH.D.		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
Less than 12 months	\$32.5	\$35.0	\$35.0	\$43.6	\$45.0	\$47.4	\$65.0	\$72.4	\$60.0
12–36 months	35.0	37.4	38.4	43.8	45.4	54.5	62.3	—	—
More than 36 months	40.0	40.0	43.7	52.0	55.8	55.5	71.0	65.0	54.2
ALL	\$33.5	\$35.0	\$36.0	\$45.0	\$50.0	\$50.4	\$65.0	\$70.0	\$60.0

NOTE: Data are median annual salaries of new chemistry graduates with full-time permanent employment as of early October each year. — = insufficient data.

NATIONAL EMPLOYMENT

Since end of boom in 2000, job growth has slowed, but college graduates held their own

NUMBER EMPLOYED, THOUSANDS	OCT. 1995	OCT. 2000	CHANGE, 1995–2000	OCT. 2006	CHANGE, 2000–06
Civilian labor force	132,716	142,622	1,981	152,052	1,572
Employed	125,388	137,088	2,340	145,337	1,375
Unemployed	7,328	5,534	-359	6,715	197
Nonfarm payrolls	117,926	132,110	2,837	136,745	773
Private employment	98,462	111,367	2,581	114,645	546
Employment, 25+ years old					
Total	106,722	116,419	1,975	125,351	1,488
College graduates	30,868	36,033	1,033	42,088	1,009
Manufacturing	17,215	17,215	0	14,166	-508
Chemicals, excluding pharmaceuticals	757	702	-11	577	-21
Pharmaceuticals	229	275	9	293	3

SOURCE: Bureau of Labor Statistics

have entered graduate or professional school.

The biggest source for employment for the 2006 graduates who found a job—full-time or part-time, permanent or tempo-

rary—was academia, with 51% of the Ph.D. graduates, 29% of the master's, and 23% of the bachelor's. These totals include those who became high school teachers.

The pharmaceutical industry accounted for 15% of the bachelor's graduates, 22% of the master's graduates, and 10% of the Ph.D.s. The chemical industry took a lower 11% of the bachelor's graduates, 4% of the master's graduates, and 7% of the Ph.D.s. All industry combined remained a major job source, accounting for 40% of the bachelor's graduates, 41% of the master's graduates, and 26% of the Ph.D.s. A high 14%

of the bachelor's graduates found employment at analytical or clinical laboratories.

The general profile of the employment situation for chemistry graduates is of growing strength from 1995 though 2000 followed by considerably slower growth since. This parallels the trends in the U.S. job market in total, as traced by Bureau of Labor Statistics (BLS) data.

According to BLS, total U.S. employ-

SALARIES BY PRIMARY WORK FUNCTION

Among B.A./B.S. grads, men seem to have slight edge, but it's likely not significant

\$ THOUSANDS	MEN	WOMEN	TOTAL
Teaching	\$37.5	\$36.1	\$36.9
Management	—	40.0	40.0
Research	40.0	36.5	38.0
Development & design	39.0	38.6	39.0
Production/quality control	34.3	35.0	35.0
Professional services	36.5	35.0	35.0
Other	36.0	32.0	32.3
ALL	\$38.0	\$35.0	\$36.0

NOTE: Data are median salaries for all bachelor's graduates with full-time permanent employment. — = insufficient data.

EVALUATION OF JOB

Graduates are apparently reasonably satisfied with their employment

PERCENT	B.A./B.S.		M.S.		PH.D.	
	AGREE	DISAGREE	AGREE	DISAGREE	AGREE	DISAGREE
MY JOB IS						
Related to my field	80%	15%	86%	12%	88%	7%
Commensurate with my training	73	18	86	7	88	8
Challenging	73	18	86	10	84	5
What I expected when I began my studies ^a					62	30

NOTE: "Agree" is the sum of "agree" and "strongly agree," and "disagree" is the sum of "disagree" and "strongly disagree." There is also a neutral option. ^a The fourth question was not asked of bachelor's and master's graduates.

WHERE THE JOBS ARE

More than half of employed Ph.D. graduates found jobs in academia

	B.A./B.S.		M.S.		PH.D.	
	ANY EMPLOYMENT	FULL-TIME ^a	ANY EMPLOYMENT	FULL-TIME ^a	ANY EMPLOYMENT	FULL-TIME ^a
Academia	23%	19%	29%	23%	51%	44%
Chemical industry	11	13	4	8	7	8
Pharmaceutical industry	15	16	22	23	10	12
Other industry	14	16	15	16	9	12
Government	7	7	11	11	6	6
Self-employed	1	1	1	1	0	0
Analytical/clinical labs	14	15	2	1	2	3
Other	15	13	16	17	15	15

NOTE: "Other" category includes biotech research, research institutions, professional services, and nonprofit organizations. ^a Permanent positions.

FURTHER STUDIES BY TOPIC

Being further along, M.S. graduates are more likely to stay with chemistry

	B.A./B.S.	M.S.
CHEMISTRY	39%	71%
OTHER SCIENCES	21	14
Biochemistry	9	2
Life sciences	3	4
Pharmacology	7	4
Other/math	2	4
ENGINEERING	1	1
Chemical/biochemical	1	0
Other engineering	0	1
HEALTH	26	11
Medicine	23	10
Dentistry	3	1
OTHER	13	3
Business management	1	0
Education	2	0
Law	1	1
Other	9	1

NOTE: Percentages of 2006 bachelor's graduates who are continuing their studies full-time.

MOST EFFECTIVE JOB-SEARCH METHODS

Don't sit and wait for the phone to ring

	B.A./B.S.	M.S.	PH.D.
Electronic sources	28%	31%	22%
Informal channel	18	19	16
Faculty adviser	10	13	18
Placement service	7	8	7
Employment agency	12	11	1
Former job	5	6	5
Newspaper ad	6	4	4
Sent unsolicited résumé	6	2	6
Unsolicited offer	1	2	2
Magazine/journal	1	0	17
Other	6	4	5

NOTE: Percentages are of graduates with full-time permanent employment.

ment grew by 2.3 million per year from 1995 to 2000 and by 1.4 million per year in the following years. Nonfarm payrolls, considered by many to be the best indicator of the job market, show a similar pattern, growing by 2.6 million per year from 1995 to 2000 and by a sharply lower 800,000 per year since.

Private employment shows the same pattern, with average annual gains of 2.8 million from 1995 to 2000 and about 550,000 since. Manufacturing jobs went from zero growth from 1995 to 2000 to an average loss of 500,000 jobs per year since.

More encouraging for chemists is what is happening to college graduates in the workforce. The number of college graduates in the workforce has grown quite consistently by about a million per year since 1995.

THE CONSTANT-DOLLAR median salaries of chemistry graduates at all three degree levels have followed the same path as the employment situation over the past decade. They all start with a low for the 1996 class. This is followed by sharp increases over the next three to five years to new all-time highs. Since then, the salaries of bachelor's and master's graduates have each held fairly steady, while salaries of Ph.D. graduates have moved lower.

The survey indicates variations within some subsets of the new-graduate population but no significant difference between the median salaries of men and women who graduated in 2006. Of all inexperienced graduates, women had an edge at the bachelor's level, with a median salary of \$35,000 versus \$34,400 for men; and at the Ph.D. level, \$62,200 versus \$60,000. Male master's graduates did a little better, \$50,000 versus \$46,900.

The difference between the salaries of those taking jobs in industry and academia is small for bachelor's graduates,

FURTHER STUDIES

Men and women graduates are equally likely to continue with education

	B.A./B.S.			M.S.		
	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL
YES	51%	50%	51%	40%	37%	38%
Full-time	47	47	47	35	33	34
Part-time	4	3	4	5	4	4
NO	49	50	49	60	63	62

NOTE: Percentages are of all 2006 graduates responding.

DEMOGRAPHICS OF 2006 CHEMISTRY GRADUATES

Nonwhites earn one-third of advanced degrees

	B.A./B.S.	M.S.	PH.D.
GENDER			
Male	48%	48%	69%
Female	52	52	31
RACE			
American Indian	1	0	0
Asian	10	24	28
Black	4	5	3
White	82	67	66
Other	4	4	3
ETHNICITY			
Hispanic	5	5	4
CITIZENSHIP			
U.S. native born	89	68	62
Naturalized	7	9	4
Permanent resident	3	4	5
Temporary visa	1	19	29
MEDIAN AGE	23	27	31

NOTE: Percentages are of all graduates responding.

FIELD OF DEGREES

Many 2006 degrees are not strictly in chemistry

	B.A./B.S.	M.S.	PH.D.
FROM CHEMISTRY DEPARTMENTS			
General chemistry	61.4%	21.9%	5.3%
Classic chemistry	4.1	54.1	72.1
Analytical	1.2	12.1	16.0
Inorganic	0.5	7.0	11.7
Organic	1.2	23.9	25.1
Physical	1.0	8.1	17.1
Polymer	0.2	3.0	2.2
Other	34.4	24.1	22.6
Biochemistry	25.2	11.7	14.3
Medical/pharmaceutical	0.7	2.4	2.2
Chemical education	3.7	3.1	0.3
Materials science	0.3	1.0	2.5
Environmental chemistry	1.1	1.5	0.3
Other	3.4	4.4	3.0

NOTE: The data are percentages of 2006 chemistry graduates. The National Center for Education Statistics and the National Science Foundation classify biochemistry as a biological science.

\$35,000 versus \$32,000, respectively. For master's graduates, it is more substantial, \$52,700 versus \$41,700; and for Ph.D.s, it is large, \$75,000 versus \$45,900.

Data from the 400 chemical engineers responding to the 2006 survey confirm that they are paid considerably more than chemistry graduates and are more likely to take a job. The median salary of an inexperienced bachelor's chemical engineering graduate was \$55,800, well exceeding the median of \$35,000 for chemists. For master's graduates, the difference was \$58,000 versus \$47,400, and for Ph.D.s, it was \$78,000 versus \$60,000. About 66% of all chemical engineering graduates took a job, compared with about 45% of the chemists.

Responding graduates indicated that the most effective job-search method was using electronic sources. Informal channels ranked second. Faculty advisers came in third.

Employment agencies were deemed quite effective by bachelor's and master's graduates but not by Ph.D.s. On the other hand, Ph.D. graduates found magazines and journals to be quite effective while bachelor's and master's graduates did not.

About 50% of both men and women bachelor's graduates are continuing with their studies. For master's graduates, it is 40% of the men and 37% of the women.

Of the bachelor's graduates who do continue, 39% stay with chemistry. Another 26% pursue medicine or dentistry. The remainder are split 21% in other sciences, 1% in engineering, and 13% in other fields.

Not surprisingly, master's graduates are more likely to stay with chemistry, at 71%. Of the others, 14% moved to other sciences, 11% to medicine or dentistry, 1% to engineering, and 3% to other fields.

As with earlier surveys, a

STARTING SALARIES BY EMPLOYER

Industry retains its big salary advantage

\$ THOUSANDS	B.A./B.S.	M.S.	PH.D.
Academia	\$32.0	\$41.7	\$45.9
Industry	35.0	52.7	75.0
Government	35.9	—	—
ALL	35.0	47.4	60.0
Grad students	21.6	22.3	—
Postdocs	—	—	36.0

NOTE: Median salaries of 2006 graduates with full-time permanent employment and less than one year of technical work experience prior to graduation. — = inadequate data.

majority of 2005–06 graduates were satisfied with the jobs they had obtained, with Ph.D.s being the most satisfied. Of bachelor's graduates, 80% agreed that their job was related to their field and 73% agreed that it was commensurate with their training. Ph.D. graduates posted 88% on both these questions.

Overall, 2006 chemistry graduates

didn't do too badly. Relatively few, 6%, were out of work and actively seeking it—and this was only a few months beyond the end of their graduating year. With the exception of the decline for Ph.D.s, constant-dollar salaries held up.

An unusually high 52% of Ph.D.s are doing postdocs. This should not be interpreted as only a sign of job-market weakness. It could also reflect the strong and ongoing trend toward an ever more highly educated U.S. workforce.

The thing that is missing for chemistry

STARTING SALARIES BY GENDER

Survey data indicate essential equality for 2006 graduates

\$ THOUSANDS	B.A./B.S.	M.S.	PH.D.
Male	\$34.4	\$50.0	\$60.0
Female	35.0	46.9	62.2
ALL	35.0	47.4	60.0

NOTE: Median salaries of 2006 graduates with full-time permanent employment and less than one year of technical work experience prior to graduation.

BACHELOR'S SALARIES

Type of job is apparently not a major determinant of salary

\$ THOUSANDS	MALE	FEMALE	ALL
Technician	\$32.0	\$34.5	\$33.9
Scientist/engineer	40.0	37.5	38.5
Manager/administrator	—	—	40.0
Teacher	37.5	36.1	36.9
Sales/marketing	34.3	—	38.2

NOTE: Data are for graduates with full-time permanent jobs. — = inadequate data.

graduates today is the ebullience of the booming salaries and equally booming job market of the late 1990s. Chemists are not alone in this.

The question for everybody in the workforce today is: Will employment in the U.S. continue with its real, if moderate, growth of late? Or will it soon peak and start to slip? BLS data of recent months can be interpreted as hinting at the latter. ■



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