



ACS
Chemistry for Life™



Starting Salaries of Chemists And Chemical Engineers: 2013

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

Steve and Clint Marchant
*Data Based Insights, Inc. on behalf of the
ACS Office of Research and Brand Strategy*

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American Chemical Society

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1115 Sixteenth Street, NW
Washington, DC 20036
800.227.5558

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For more than three decades, the American Chemical Society has prepared an annual survey of new graduates. This year, under the direction of the ACS Committee on Economic and Professional Affairs' Subcommittee on Surveys, the ACS conducted a survey to determine trends in starting salaries and the employment status of chemists and chemical engineers. This report presents the detailed results of the 2013 survey of new graduates.

The survey was conducted and managed by Gareth Edwards, Senior Research Associate in the ACS's Office of Research and Brand Strategy. Andrew Bell of Intelliscan, Inc. directed the data collection. Steve and Clint Marchant of Data Based Insights, Inc. (an affiliate of Intelliscan) analyzed the results of the survey and prepared this report.

Gareth Edwards
Senior Research Associate
Office of Research and Brand Strategy

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SUMMARY AND COMMENTS

The *Starting Salaries of Chemists and Chemical Engineers: 2013* report examines new graduates from July 2012 to June 2013 and documents the starting salaries for those who obtained a full-time job by the first Monday in October (October 7, 2013). The report discusses median and mean starting salaries, and summarizes how salaries have changed over time. It presents current findings on salary ranges, employment sectors, and salaries between genders. It assesses the proportion of graduates that are going on to advanced studies. It covers employment status, unemployment and job satisfaction.

- *Inexperienced* new graduates earned a median full-time starting salary of \$41,600 in 2013. By degree, median salary was \$39,560 for bachelor's, \$55,000 for masters, and \$75,750 for doctorate degree graduates (Table 1a).
- *Chemistry graduates with Ph.Ds.* and less than a year of professional work experience earned median salaries slightly trailing inflation, earning -0.3% less than in 2012 (Table 1b).
- Median salary for *chemical engineers* with less than a year of professional work experience was virtually unchanged in 2013 at \$66,700 in current dollars (Table 1c).
- New inexperienced *chemistry graduates* who work in the government sector have a higher median starting salary (\$42,000) than their peers in academia (\$39,000) and industry (\$38,000) over the past 5 years (2009-2013). A 5 year period was used to increase the sample size for stability. (Table 5b)
- Compared to recent chemistry graduates, the highest paying sector for chemical engineers is reversed. The government is well behind industry and academia in the median salaries it pays for new chemical engineering graduates.
- A salary gap between men and women continues among new chemistry graduates, where female chemists earn a median starting salary -5.7% less than male chemists. However, among chemical engineers there is not a large median salary gap. In fact, in 2013 inexperienced female chemical engineers earn a slight +1.9% over male chemical engineers. (Table 7)
- 38% of chemistry and 16% of chemical engineering BS/BA and MS graduates combined are pursuing advanced study programs either full or part-time in fall 2013. (Table 8)
- Unemployment rates for new graduates soared to 14.9% in 2013, up from 12.6% last year. US government statistics show lower unemployment rates heading into 2014, which perhaps is an indicator that the employment picture for graduating chemists may improve. (Figures 4 & 5)

STARTING SALARIES

MEDIAN STARTING SALARIES

Median Salaries for all New Graduates: In 2013, an *inexperienced* (defined as having less than 12 months of work experience) new graduate earned a median full-time salary of \$41,600. In current dollars, the 2013 median starting salary is the same as in 2012; however, after adjusting for 1.0% inflation from October 2012 to October 2013 new graduates with a full-time job have slightly less buying power.

Table 1a. Median Full-Time Starting Salaries for Inexperienced New Graduates
(Chemistry & Chemical Engineering Graduates Combined 2012-2013)

	Median Salary in Current Dollars		% Change from 2012	
	2012	2013	Current Dollars	Constant Dollars*
All New Grads	41,600	41,600	0.0%	-1.0%
Bachelor's	40,000	39,560	-1.1%	-2.1%
Master's	48,000	55,000	+14.6%	+13.4%
Doctorate	80,000	75,750	-5.3%	-6.3%

* Rate of inflation = 1.0%

Table 1a compares median salary from 2012 to 2013 among inexperienced new graduates by degree:

- **Bachelor:** The median salary for *inexperienced bachelor's degree* recipients declined \$440 in 2013. After calculating 1.0% inflation, the real impact is \$840 dollars in reduced income from 2012 to 2013.
- **Master:** The magnitude of salary increase for new master's degree graduates is a likely function of small sample sizes.
- **Doctorate:** Median salary among *PhD* recipients with less than 12-months work experience dropped \$4,250 or -5.3% from \$80,000 in 2012 to \$75,750 in 2013 current dollars.

Constant dollar calculations are based on the change in the Consumer Price Index (CPI) from October 2012 to October 2013, which registered an increase in prices of 1.0% over the one year period. The CPI measures the change in the price of a constant basket of consumer goods and services over time. The increase is a measure of inflation.

Median Salaries for Chemistry Graduates: Among inexperienced chemistry graduates starting median full-time salary grew slightly ahead of inflation by +0.5% in constant dollars. Overall median starting salary increased from \$39,000 in 2012 to \$39,600 in 2013.

Table 1b. Median Full-Time Starting Salaries for Inexperienced Chemistry Graduates (2012-2013)

	Median Salary in Current Dollars		% Change from 2012	
	2012	2013	Current Dollars	Constant Dollars*
All Chemists	39,000	39,600	+1.5%	+0.6%
Bachelor's	36,000	35,360	-1.8%	-2.7%
Master's	46,500	55,000	+18.3%	+17.3%
Doctorate	74,500	75,000	+0.7%	-0.3%

* Rate of inflation = 1.0%

Table 1b compares median salary from 2012 to 2013 among inexperienced new **chemistry** graduates by degree:

- **Bachelor:** New chemistry graduates with a bachelor's degree have a starting median salary of \$35,360, a \$640 decrease since 2012. In constant dollars, the 2013 median salary would have been comparable to a salary of \$35,257 in 2012.
- **Masters:** The median starting salary for master's degree recipients in 2013 is \$55,000. While this appears to be a sizeable increase, the magnitude of this change may be due to smaller sample sizes for master's degree recipients.
- **Doctorate:** Median starting salary of \$75,000 among PhD recipients keeps pace with inflation (-0.3% change vs 2012).

Note: Salary data is based on new graduates as of May-June 2012 or 2013 who had obtained full-time permanent employment by the first week of October the same year.

Median Salaries for Inexperienced Chemical Engineering

Graduates: Inexperienced chemical engineering graduates earned a median starting salary of \$67,000 in 2013, which is unchanged from 2012 in current dollars. After inflation, the equivalent of the 2013 salary in 2012 would have been \$66,330.

Table 1c below shows the net changes by degree:

- **Bachelor:** Chemical engineers receiving bachelor's degrees in 2013 earned virtually the same median starting salary as did bachelor's graduates in 2012 in current dollars, which represents a small loss of income once calculating inflation.
- **Master and Doctorate:** Salary sample sizes for new graduates with *Master's degrees* and *Ph.Ds.* are not shown because they are too small to be reliable.

Table 1c. Median Full-Time Salaries for Inexperienced Chemical Engineers 2012-2013

	Median Salary in Current Dollars		% Change from 2012	
	2012	2013	Current Dollars	Constant Dollars*
All Chem. Engrs.	67,000	67,000	0.0%	-1.0%
Bachelor's	66,750	66,700	-0.1%	-1.1%

* Rate of inflation = 1.0%

MEAN STARTING SALARIES

Mean Starting Salaries for all New Graduates: The average (mean) full-time starting salary for all inexperienced new graduates – chemistry and chemical engineering graduates combined – declined by \$758 in current dollars or \$765 factoring inflation 2012 vs 2013.

Note: Mean salaries tend to be higher than corresponding median salaries, because several graduates including chemical engineers – a smaller group overall -- are able to command significantly higher salaries, which skews the corresponding means higher.

Table 2a. Mean Full-Time Starting Salaries for Inexperienced New Graduates
(Chemistry & Chemical Engineering Graduates Combined 2012-2013)

	Mean Salary in Current Dollars		% Change from 2012	
	2012	2013	Current Dollars	Constant Dollars*
All New Grads	47,883	47,125	-1.6%	-2.5%
Bachelor's	43,801	43,217	-1.3%	-2.3%
Master's	51,154	53,359	+4.3%	+3.3%
Doctorate	75,484	71,362	-5.5%	-6.4%

* Rate of inflation = 1.0%

- As shown in **Table 2a**, all new graduates earned a mean salary of \$47,125 in 2013, a -1.6% change from 2012 in current dollars.
- **Bachelor:** Inexperienced graduates with a bachelor's degree earned a mean starting salary of \$43,217 in 2013, earning an average of \$584 less than counterparts from a year ago, which when factoring inflation represents nearly a \$590 loss of resources for new graduates in 2013 based on constant dollar calculation versus the previous year.
- **Masters:** Inexperienced master's graduates earned a mean \$53,359 starting salary in 2013.
- **Doctorate:** Mean starting salary for inexperienced PhD graduates is \$71,362 in 2013, an erosion of starting mean salary of -6.4% in constant dollars.

Means for Inexperienced Chemistry Graduates: Mean salary among all chemistry graduates with less than 12 months professional experience was \$42,679 in 2013. This current dollar figure is \$100 above the 2012 mean of \$42,580. Graduates in 2013 have a starting salary that falls behind inflation by -0.8%, or about \$340 based on salary means.

Table 2b. Mean Full-Time Starting Salaries for Inexperienced Chemistry Graduates (2012-2013)

	Mean Salary in Current Dollars		% Change from 2012	
	2012	2013	Current Dollars	Constant Dollars*
All Chemists	42,580	42,679	+0.2%	-0.8%
Bachelor's	37,210	37,660	+1.2%	+0.2%
Master's	50,351	51,998	+3.3%	+2.3%
Doctorate	72,574	69,613	-4.1%	-5.0%

* Rate of inflation = 1.0%

Referring to **Table 2b** above, the net changes by degree for chemistry graduates were:

- **Bachelor:** Mean starting salaries for inexperienced chemistry graduates in 2013 increased slightly ahead of inflation (0.2%).
- **Masters:** New master's graduate mean starting salaries improved to \$52,000, and increase of 2.2% in constant dollars.
- **Doctorate:** *Ph.D.* new chemistry graduates received a decreased salary of -4.1% in current dollars, a net loss of -5.0% in constant dollars.

Means for Inexperienced Chemical Engineers: Chemical engineering new graduates in the professional or technical workforce for less than 12 months received a mean salary of \$67,512 in 2013. This was a -0.5% decrease over the mean salary of \$67,845 for new graduates in 2012. However, in real dollars the mean salary for new chemical engineering graduates was lower in 2013 by -1.5%.

Table 2c. Mean Full-Time Salaries for Inexperienced Chemical Engineers (2012-2013)

	Mean Salary in Current Dollars		% Change from 2012	
	2012	2013	Current Dollars	Constant Dollars*
All Chem. Engrs.	67,845	67,512	-0.5%	-1.5%
Bachelor's	65,530	66,064	+0.8%	-0.2%

* Rate of inflation = 1.0%

Table 2c below shows the net changes by degree:

- **Bachelor:** Chemical engineers receiving bachelor's degrees in 2013 received a net increase of \$534 or +0.8% in current dollars. Starting salary in 2013 kept approximate pace with inflation, a slight -0.2% decrease in constant dollars.
- **Masters and Doctorate:** Sample sizes for *Master's degree* and *PhD* recipients are too small to be reliable and are not shown.

**SALARY INCREASES
OVER TIME**

Table 3 shows annual median starting salaries for *inexperienced* chemists and chemical engineers salaries from 1985 through 2013.

Table 3. Median Starting Salaries for **Inexperienced** Graduates by Degree 1985-2013 (\$000)

Year	Chemists			Chemical Engineers		
	B.A./B.S.	M.S.	Ph.D.	B.A./B.S.	M.S.	Ph.D.
1985	19.5	27.0	35.9	28.0	31.4	40.0
1986	18.6	26.1	38.0	28.4	31.0	41.5
1987	20.0	28.0	38.4	30.0	32.5	43.0
1988	21.9	27.7	40.5	31.0	33.0	44.4
1989	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
1991	23.0	32.0	46.0	37.5	40.2	52.0
1992	24.0	31.5	47.5	40.0	41.5	54.0
1993	24.0	34.0	50.4	40.5	42.2	52.7
1994	24.0	30.8	48.0	n.a.	n.a.	n.a.
1995	25.0	36.0	50.0	40.0	44.2	59.2
1996	25.0	34.1	45.0	41.5	45.0	57.0
1997	28.0	37.5	54.0	42.0	47.0	60.0
1998	29.5	38.5	59.3	45.0	49.8	65.0
1999	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
2001	32.2	43.0	69.5	51.0	60.0	73.5
2002	31.0	45.0	67.0	50.0	59.0	75.0
2003	32.0	44.5	63.3	52.0	55.0	72.0
2004	32.6	43.3	65.0	52.0	59.3	78.6
2005	35.0	45.0	72.0	54.0	62.2	83.0
2006	35.0	47.4	60.0	55.8	58.0	78.0
2007	37.0	48.0	75.0	58.0	65.5	84.5
2008	35.0	49.8	75.0	63.0	60.0	85.0
2009	33.6	48.5	73.1	66.0	60.0	86.8
2010	35.0	45.1	72.0	64.0	n.a.	93.5
2011	35.0	46.7	76.0	62.5	n.a.	100.0
2012	36.0	46.5	74.5	66.8	75.2	93.0
2013	35.4	55.0	75.0	66.7	n.a.	n.a.

Cells with fewer than 15 cases not available and indicated with "n.a."

Over the 28 year period, starting salaries have almost doubled for chemists and more than doubled for chemical engineers. Looking at **Table 3**, the starting median salary for *inexperienced chemists* working full-time in permanent positions with a bachelor's degree in 1985 was \$19,500. In 2013, a B.S. graduate with the same credentials would receive a median wage of \$35,360.

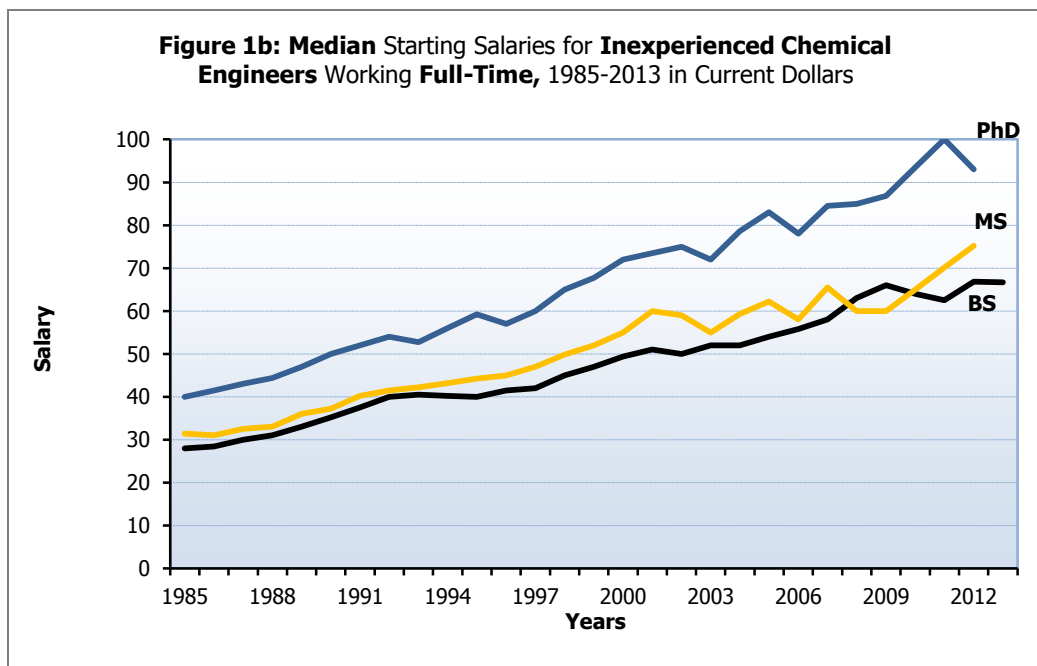
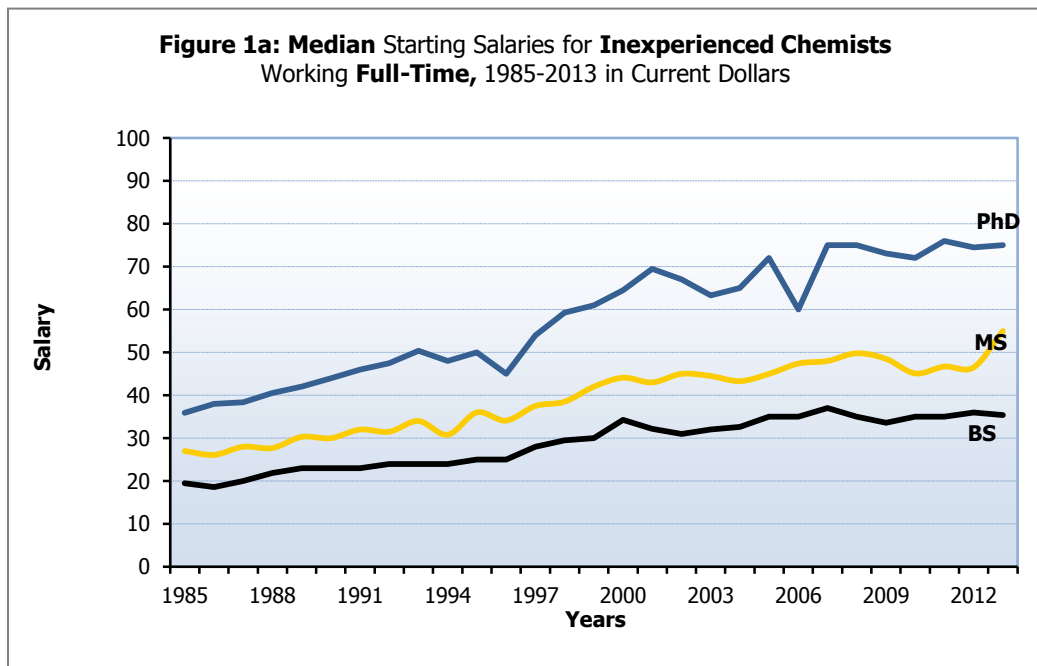
The gaps between starting levels for each of the 3 *chemistry* degrees have also changed:

- **1985:** The starting median for an M.S. degree in chemistry in 1985 was \$27,000 or 39% more than the bachelor's degree median of \$19,500. The starting median for a Ph.D. in chemistry was \$35,900 or 33% higher than the M.S. degree.
- **2013:** Fast forward to 2013 and the starting median for an M.S. degree in chemistry is \$55,000, which is 55% more than the \$35,360 median for bachelors. However, the starting median for a chemist with a Ph.D. is \$75,000, which is 36% higher than the median for the M.S. degree (and 112% higher than the bachelor's starting wage).
- **Benchmark Highs:** The highest starting median salary for *chemists* with a bachelor's degree was \$37,000 in 2007, six years ago. Median salary high points for chemists with more advanced degrees were within the past two years: \$55,000 for a master's degree in 2013, and \$76,000 for a Ph.D. in 2011.

Chemical engineers start with higher salaries but the gaps between degrees is not quite so big.

- **1985:** In 1985 the starting median for an M.S. degree in chemical engineering was \$31,400, which was just 12% higher than the starting median for bachelors of \$28,000. The Ph.D.'s starting median was \$40,000 or 27% higher than the M.S. median.
- **2013:** Jumping to 2013, there are an insufficient number of new inexperienced graduates with an M.S. or a Ph.D. to draw conclusions.
- **Benchmark Highs:** The highest starting median salaries for *chemical engineers* were in the past two years: \$66,800 for bachelor's degrees in 2012, \$75,200 for master's degrees in 2012, and \$100,000 for Ph.D.'s in 2011 (see Table 3 for details).

Figures 1a & 1b depict salary trends for chemists and chemical engineers by using the data in Table 3 as plot points.



STARTING SALARIES BY PERCENTILE

Table 4a and 4b break down starting salary ranges for inexperienced full-time permanently employed chemistry and chemical engineering graduates, respectively.

- **Bachelor:** In 2013, the top 10% of new bachelor's degree graduates earned \$53,000 and the bottom 10% earned \$25,000 in starting salary. Compared with 2012, the gulf between top and bottom has expanded. For 2012, the top 10% earned at least 92% more than the bottom 10%. The gulf between top and bottom increased to 112% in 2013.
- **Master:** In 2013, the top 10% of inexperienced chemistry graduates with a master's degree earn 81% more than the bottom 10%.
- **Doctorate:** Among inexperienced chemistry graduates earning a PhD in 2013, the starting salary of the top 10% is \$96,000 or more, which is 129% more than the bottom 10% who start with \$42,000 or less.

Table 4a. Ranges of Starting Salaries of **Inexperienced Full-Time** Employed **Chemistry** Graduates by Degree 2012 & 2013

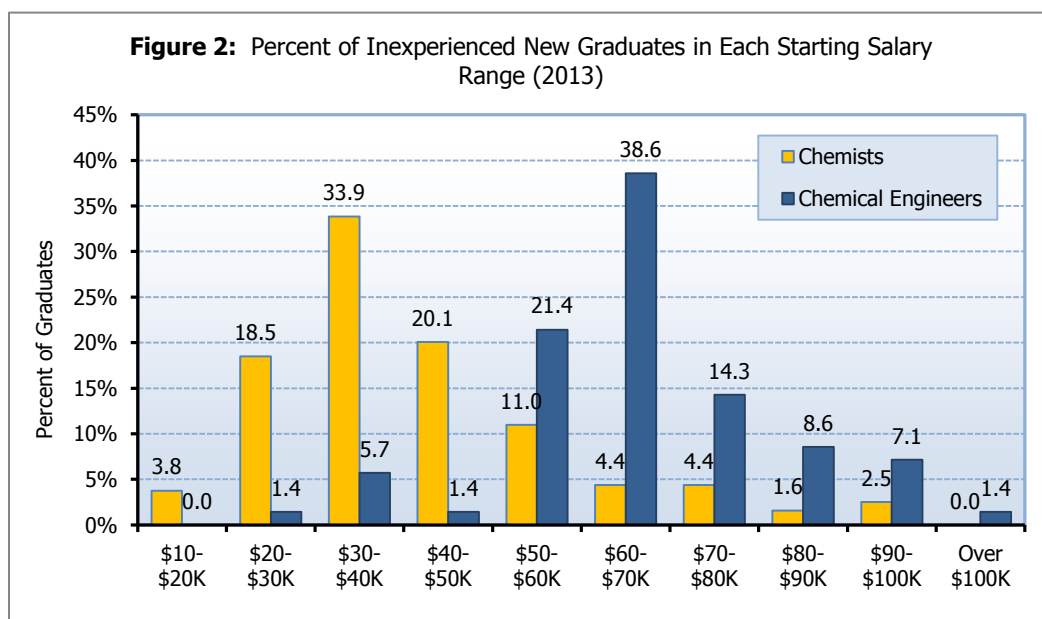
	Bachelor's		Master's		Doctorates	
	2012	2013	2012	2013	2012	2013
90 th Percentile	50,000	53,000	71,600	65,000	96,770	96,000
75 th Percentile	41,680	44,000	57,525	60,000	90,225	83,500
50 th Percentile	36,000	35,360	46,500	55,000	74,500	75,000
25 th Percentile	31,200	30,000	40,838	45,000	53,750	51,820
10 th Percentile	26,000	25,000	34,290	36,000	40,500	42,000
Mean	37,210	37,660	50,351	51,998	72,574	69,613
Count	211	259	30	21	30	41
Std. Deviation	9,171	11,718	14,487	13,766	21,232	19,801
Std. Error of Mean	631	728	2,645	3,004	3,876	3,092

Table 4b: Chemical engineers with bachelor's degrees had a starting median of \$66,700 in 2013. The top 10% of *inexperienced* graduates received salaries exceeding \$85,000 or 27% higher than the median. Graduates at the low end of the range received salaries at least 20% lower than the median, or below \$53,500. Data are not robust enough to report for graduates with Master's degrees and Ph.Ds.

Table 4b. Range of Starting Salaries for **Inexperienced Full-Time** Employed **Chemical Engineering** Graduates with Bachelor's Degrees 2012 & 2013

	Bachelor's	
	2012	2013
90 th Percentile	82,000	85,000
75 th Percentile	71,000	72,000
50 th Percentile	66,750	66,700
25 th Percentile	60,000	60,000
10 th Percentile	51,250	53,500
Mean	65,530	66,064
Count	64	63
Std. Deviation	12,206	13,622
Std. Error of Mean	1,526	1,716

Figure 2 summarizes the difference in starting full-time salary range between inexperienced new graduate chemists and chemical engineers. Among inexperienced chemistry graduates, 72% have starting salary within a range of \$20 to \$50K. A new chemical engineering graduate typically earns more -- 74% in 2013 earned a starting salary between \$50 and \$80K.



SALARIES BY EMPLOYMENT SECTOR

Median Salaries by Employment Sector: Over the past five years (2009-2013), new graduates have taken jobs in the work force in the following proportions:

Table 5a. Placement of Inexperienced New Graduates (2009-2013)

Sector	Chemistry Graduates	Chemical Engineering Graduates
Industry	71%	89%
Academia	20%	6%
Government	9%	4%

The combined 2009-2013 data reveal government jobs have paid the highest starting salary for new *chemistry* graduates during the past 5 years, on average. In contrast, industry and academia sectors offer new *chemical engineering* graduates a more competitive starting salary than does the government sector:

Table 5b. Median Salaries for Inexperienced New Graduates (2009-2013)

Sector	Chemistry Graduates	Chemical Engineering Graduates
Industry	38,000	66,627
Academia	39,000	62,000
Government	42,000	58,000

Medians are based on unadjusted current dollar data as collected across the 5 year period.

As **Table 6** indicates, industry sector full-time starting salaries maintain value from 2012 to 2013, with salary growth slightly ahead of inflation (+0.5%). Government sector starting salaries also fluctuated slightly, but trail -2.4% behind constant dollars. Where starting salary for new graduates changed substantially was in the academic sector where the 2013 median starting salary fell to \$36,500, a -9.3% loss of value in constant dollars.

Table 6. Median Salaries for All **Inexperienced** New Graduates Working **Full-Time Permanent** Jobs by Employment Sector 2012-2013

	Median Salary in Current Dollars		% Change from 2012	
	2012	2013	Current Dollars	Constant Dollars*
All Sectors	41,680	41,600	-0.2%	-1.2%
Industry	43,000	43,635	+1.5%	+0.5%
Government	41,000	40,405	-1.5%	-2.4%
Academia	39,857	36,500	-8.4%	-9.4%

* Rate of inflation = 1.0%

EQUALITY OF THE SEXES

The difference in starting salary between men and women among full-time permanent inexperienced chemistry graduates is 5.7%. Among those earning bachelor's degrees, the salary differential is smaller where women earned -2.6% less than men. However, while it may appear that female PhD chemists earn far less (-31.3%) than their male counterparts, the smaller number of inexperienced doctorate chemists responding to the survey may exaggerate the salary differential in median starting salary between men and women in this group.

Among new chemical engineers, the median starting salary difference favors women by +1.9%.

The sub-samples for inexperienced chemists with master's degrees and chemical engineers with master's degrees and Ph.D.'s are quite small and therefore not shown.

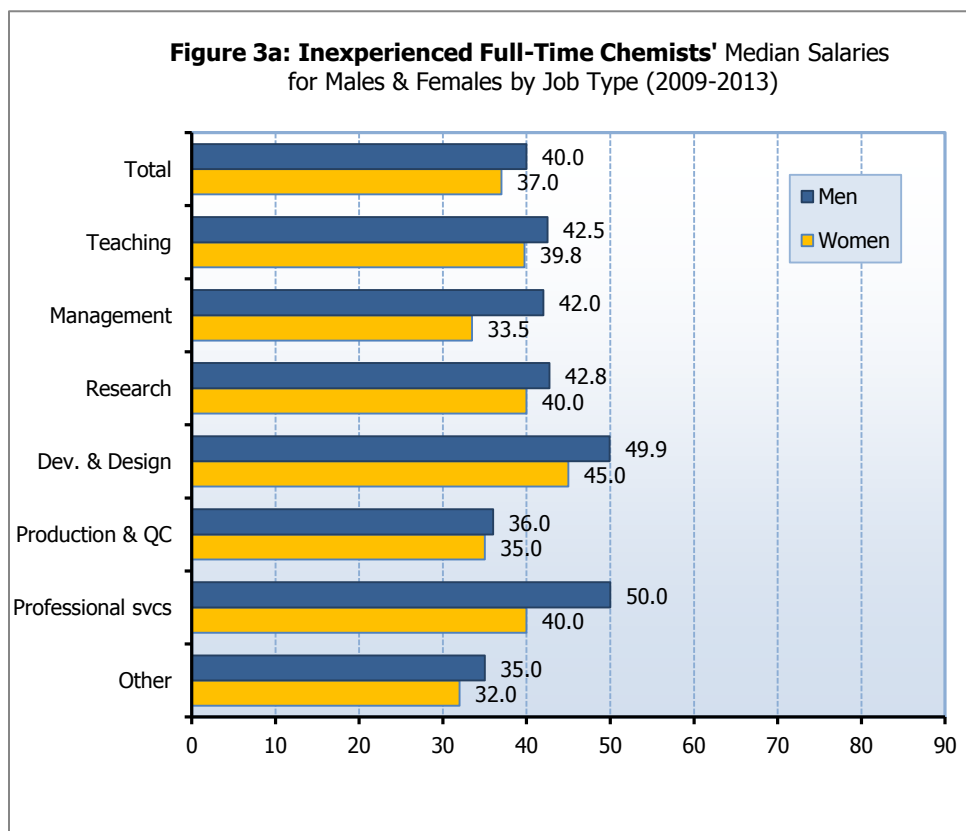
Table 7. Median Starting Salaries for Male and Female **Full-Time Permanent Inexperienced** Chemists and Chemical Engineers by Gender in 2013

	Chemistry Graduates			Chemical Engineering Graduates		
	Men	Women	Difference	Men	Women	Difference
All Degrees	40,000	37,720	-5.7%	67,000	68,300	+1.9%
Bachelor's	35,940	35,000	-2.6%	66,700	67,477	+1.2%
Master's	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Doctorate	80,000	55,000	-31.3%	n.a.	n.a.	n.a.

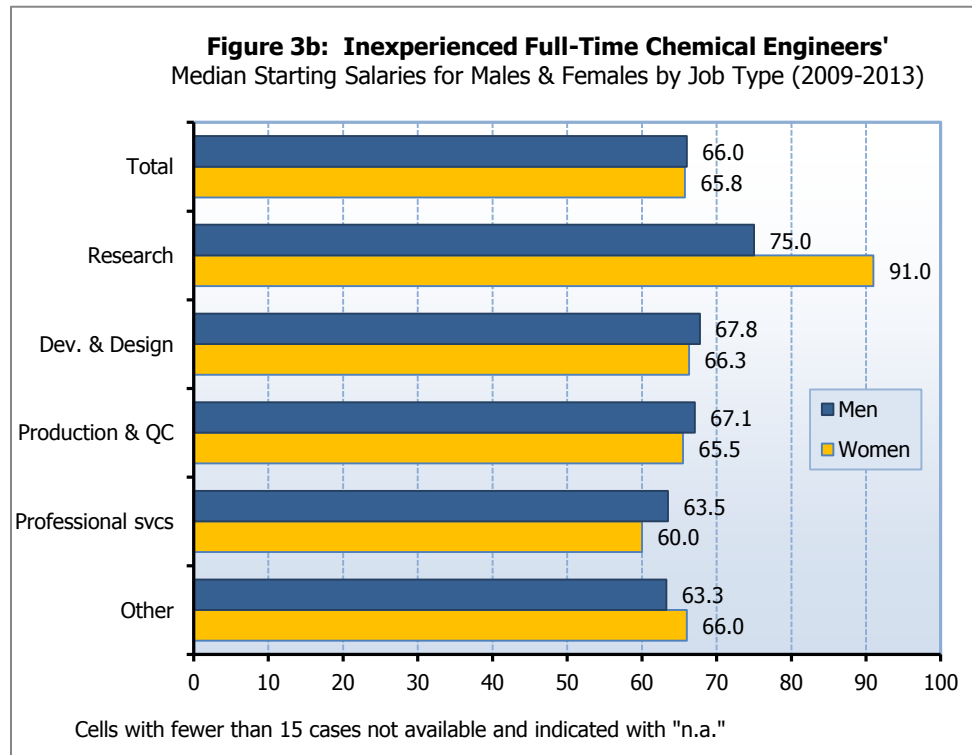
Cells with fewer than 15 cases not available and indicated with "n.a."

Chemists: Figure 3a compares men's and women's median starting salaries for *chemists* with less than 12 months professional or technical work experience by different job types. To obtain a representative sample across a fairly large number of breaks, we have combined data over a five year span (2009-2013) to base the results on a robust sample of 759 women and 649 men.

Across all the job categories, among inexperienced chemists over the past 5 years, males have a higher median starting salary than women (men earned +\$3,000). The two categories with the greatest gender salary difference are Professional Services (men earned +\$10,000) and Management (men earned +\$8,500). The job category with the smallest difference in salary between men and women is Production and Quality Control (men earned +\$1,000).



Chemical Engineers: Among inexperienced chemical engineers, data over the past five years shows median starting salaries are for the most part equal between men (median \$66,000) and women (median \$65,800). One area where women appear to earn a premium starting salary over men is Research (women earned +\$16,000). However, as a reminder, interpret the results with some caution as the samples for chemical engineers tend to be small, even over 5 years of data.



PLANS FOR ADVANCED STUDY

As presented in **Table 8**, approximately 38.5% of 2013 chemistry student graduates are currently pursuing advanced studies that started in the fall of 2013. About 35% are enrolled full-time toward an advanced degree. Another 3% of new chemistry graduates study on a part-time basis. Chemistry graduates are about twice as likely as chemical engineering graduates to be enrolled in some form of advanced study. Gender does not appear to have much of an impact on the pursuit of advanced study as the split between females and males is about even in 2013.

Table 8. Advanced Studies by Degree Field and Gender (2013)

	Degree Field			Gender		
	Chem- istry (n = 1,673)	Chem. Engrn. (n = 143)	Total (n = 1,816)	Female (n = 928)	Male (n = 847)	Total (n = 1,775)
Enrolled Full-Time	35.1%	14.0%	33.5%	33.4%	33.5%	33.5%
Enrolled Part-Time	3.3%	2.1%	3.2%	4.3%	2.1%	3.3%
Not Enrolled	61.5%	83.9%	63.3%	62.3%	64.3%	63.3%

The overall trend in post-graduate education has been declining. In 1995, 42.3% of graduates continued their education after graduation. In 2013, the proportion of graduates pursuing an advanced degree either full or part-time has declined by roughly 1/3 to 36.7%.

Table 9 shows the fields of advanced study that chemistry and chemical engineering B.S./B.A. and M.S. graduates have enrolled in for fall 2013. The table combines full and part-time students and breaks out the fields of study by chemistry and chemical engineering graduates who are continuing their education. Because the sample sizes are fairly thin for reliably covering the list of advanced degree fields of study, the table shows the combined results over 5 years (2009-2013) for enhanced stability. It is important to note that the 5 year results do not differ much from the 2013 solo results, indicating that the data holds together quite well on a year-over-year basis.

Among chemistry graduates in pursuit of an advanced degree, 36.1% pursue further chemistry education and training. Outside of further chemistry education, 18.3% of chemistry graduates study a scientific field (fields 2 through 6 on the list), 36.4% pursue degrees in the medical profession (medicine, dentistry, pharmacy), and the remaining 9.3% study non-scientific professions such as business management, education, law or other endeavors.

Chemical engineers are more strongly focused on advancing their chemical engineering expertise. Based data over the past 5 years, 62.1% pursued advanced study in either chemical or biochemical engineering.

Table 9: Fields of Advanced Study Started in Fall of the Year of Graduation by Chemistry and Chemical Engineering Graduates Across 2009-2013

	Chemistry	Chemical Engineering
	2009-2013 (n = 3,837)	2009-2013 (n = 219)
Chemistry	36.1%	7.3%
Other Physical Science/Math	4.0%	n.a.
Chem/Biochem Engineering	1.3%	62.1%
Other Engineering	1.3%	8.2%
Biochemistry	7.8%	n.a.
Life Science	3.9%	n.a.
Medicine	22.8%	9.1%
Dentistry	3.3%	n.a.
Pharmacy	10.3%	n.a.
Business Management	0.8%	n.a.
Education	3.3%	n.a.
Law	1.1%	n.a.
Other	4.1%	n.a.

Cells with fewer than 15 cases not available and indicated with "n.a."

EMPLOYMENT STATUS

EMPLOYMENT STATUS

Table 10 below brings all employment variables tracked by the new graduate study together in a single summary table for all 2013 graduates:

Table 10. Summary of Employment Status for All New Graduates 2013

Employment Status	Respondent Counts	Percent
Full-Time Permanent	568	29.0%
Full-Time Temporary	180	9.2%
Part-Time Permanent	37	1.9%
Part-Time Temporary	131	6.7%
Graduate Student/Postdoc	686	35.0%
Not Employed/but Seeking	292	14.9%
Not Employed/not Seeking	67	3.4%
TOTAL	1,961	100.0%

UNEMPLOYMENT

Unemployment among new graduates is 3 times as high as the rate for regular ACS members.

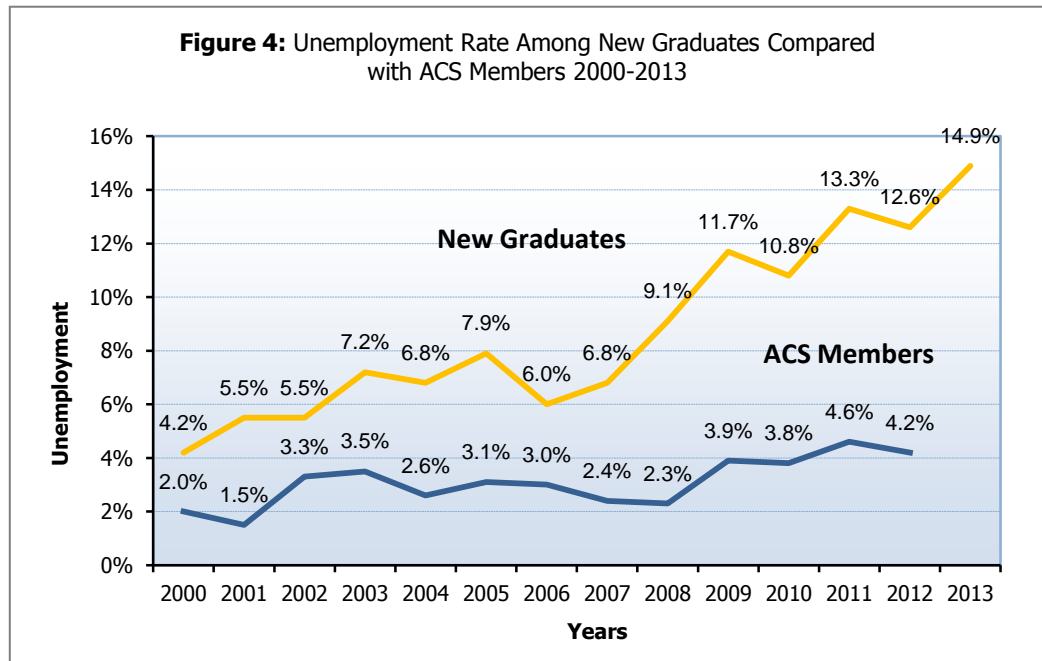
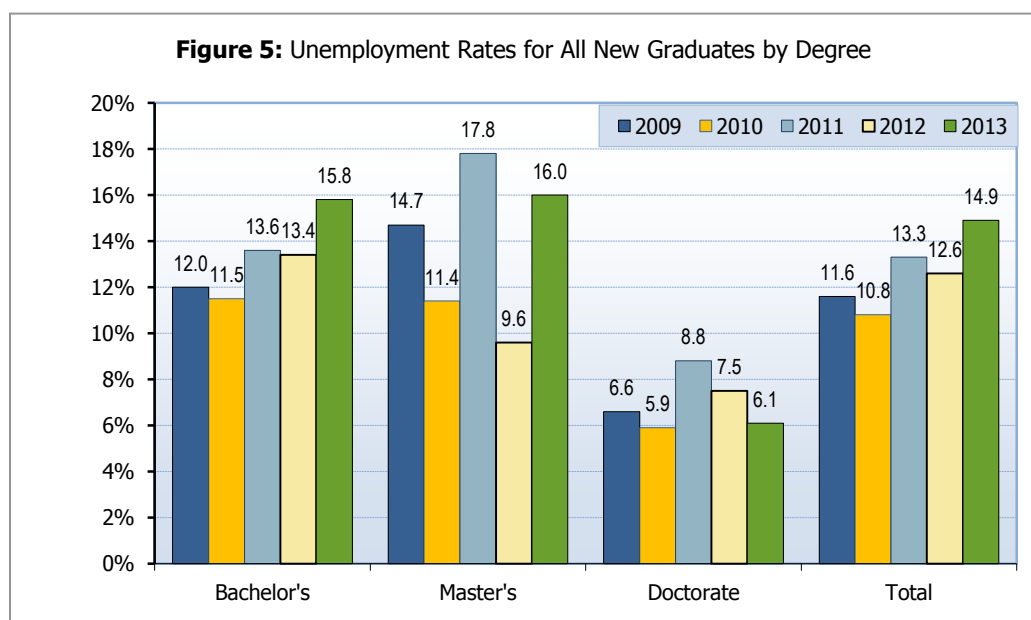


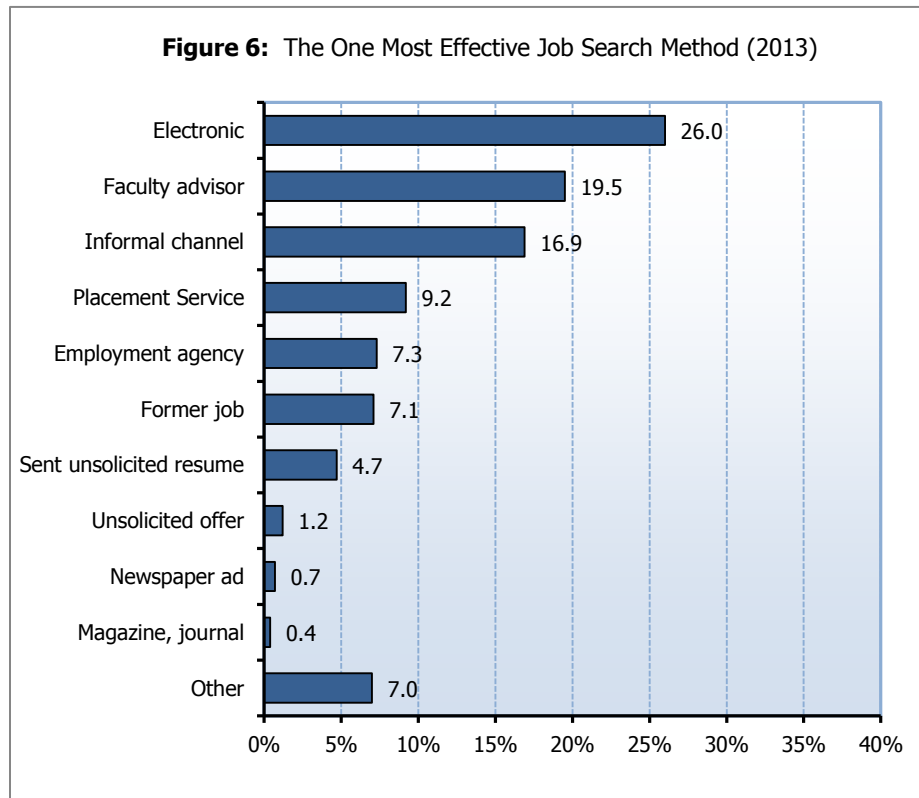
Figure 5 compares the unemployment rates for bachelor's, master's and doctorate degree recipients from 2009 to 2013. Overall, the employment picture for new chemistry and chemical engineering graduates was bleak in 2013 as unemployment was on the rise. Full-time employment over the past five years (2009-2013) has been increasingly more difficult for new graduates to attain. In 2013, 14.9% of all new chemistry and chemical engineering graduates were unemployed. According to government reports, unemployment in the broader job market slowly declined in 2013 heading into early 2014. At some point this should translate to a better employment picture for new chemistry graduates.



JOB SEARCH

Graduates that found employment by October 1, 2013 were asked to name the “one most effective job search method” they used. The results are shown in **Figure 6**.

Approximately 1 in 4 new graduates named *electronic resources* the most effective method in searching for a job. New graduates mention a variety of job posting sites such as Indeed.com, CareerBuilder.com, craigslist.org, and Monster.com. Other electronic resources graduates used were specific company websites or electronic networking via Linked-In. New graduates next mention their *faculty advisor* (19.5%) as most effective, followed by traditional networking through friends and colleagues *information channels* (16.9%) to round out the three search methods a majority found most effective.

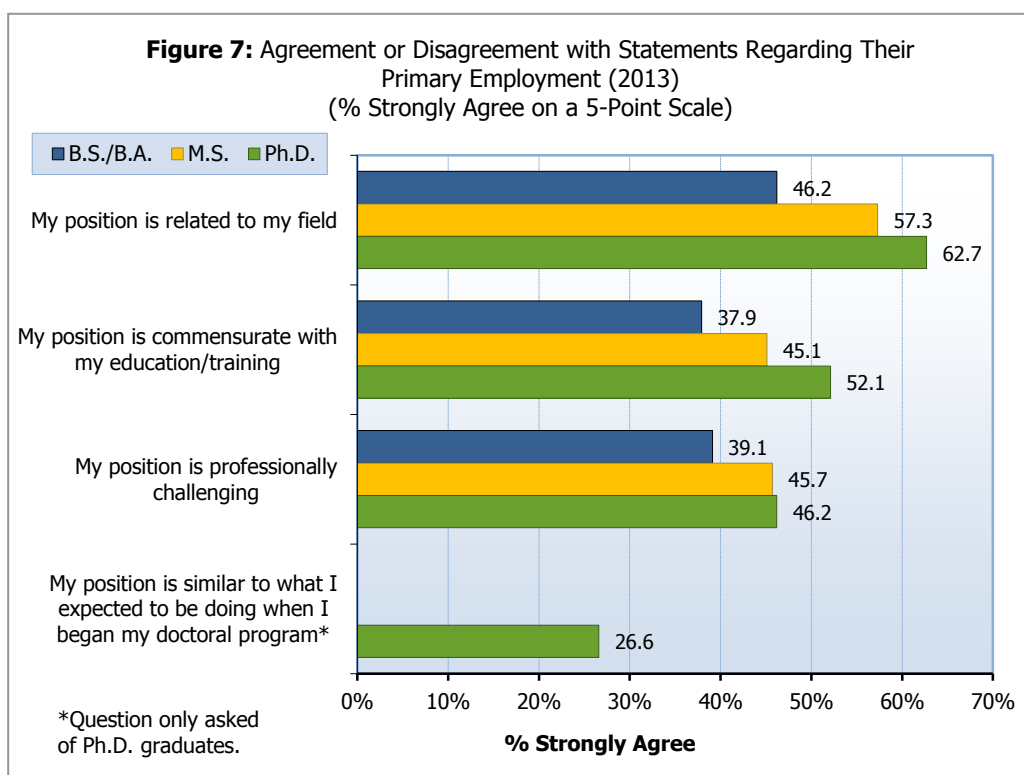


JOB SATISFACTION

Graduates who found full-time permanent employment were also asked a series of questions about how well their educational training prepared them for their job. Three questions were asked (4 for Ph.D.s.) using a scale of *strongly agree*, *agree*, *no opinion*, *disagree* and *strongly disagree*. "Strongly agree" is the most sensitive response and represents the result that university programs are trying to achieve.

Figure 7 shows the "strongly agree" results for chemistry graduates. As one would expect, the higher the degree earned the more likely a respondent "strongly agrees" that their position is *related to their field* or that their position is *commensurate with education/training*. Ph.D.s are a deeper and/or more specialized group often hired with clear responsibilities.

Less than half of all new graduates, regardless of degree, say that they "strongly agree" their position is *professionally challenging*.



DEMOGRAPHICS

Table 11. 2013 New Graduate Demographics (n = 2,035)

	Count	Percent
Highest Degree		
Bachelor's	1,730	85.4%
Master's	110	5.4%
Doctorate	185	9.1%
Field of Study		
Chemistry	1,837	91.0%
Chemical Engineering	169	8.4%
Non-Chemistry	12	0.6%
Gender		
Male	958	48.7%
Female	1,011	51.3%
Ethnicity		
American Indian	9	0.5%
Asian	268	13.9%
Black	84	4.4%
White	1,449	75.8%
Multiracial	55	2.9%
Other	49	2.6%
Age		
21 or Under	61	3.1%
22	737	38.0%
23-24	610	31.5%
25-29	338	17.4%
30-34	128	6.6%
35-39	38	2.0%
40-49	17	0.9%
50-64	8	0.4%
65 and Over	0	0.0%

Counts may not total 2,012 because not all respondents answered.

Table 11 holds demographics for all new graduates participating in the 2013 ACS survey. It provides a breakout of highest degree earned, field of study, gender, ethnicity and age of all respondents. The super majority received a bachelor's degree (85%), studied chemistry (91%), is white (76%) and between the ages of 22 and 29 (87%). Gender representation skews slightly female (51%).

Table 12 divides the respondents by the degree they received. Chemical engineers represent 13.6% of the graduates that received a Ph.D. in 2013. While this proportion is greater than the percent of chemical engineers receiving bachelors and master's degrees, it represents a decline from 19.1% of chemical engineers who received a Ph.D. in 2011.

Females and males are about even in number of graduates receiving B.S./B.A. and M.S. degrees, but males are still dominant in receiving doctorate degrees. The demographic of new PhD graduates is changing. Back in 2008, 67% of doctorate degrees were awarded to men and only 33% were awarded to women. In 2013, the gap between men and women receiving Ph.Ds. has been reduced to 57% to 43%, respectively.

Asians continue to have a stronger than per capita presence among PhD graduates. Asians were 13.9% of the degree recipients in 2013, but they accounted for 24% of the Ph.Ds. awarded. In contrast, whites account for 75.8% of the graduates in 2013, but account for 68.9% of the Ph.Ds. awarded.

Table 12. 2013 Demographics by Degree (n = 2,035)

	Bachelor's	Master's	Doctorate
Field of Study			
Chemistry	91.9%	89.9%	83.2%
Chemical Engineering	7.8%	10.1%	13.6%
Non-Chemistry	0.3%	--	3.3%
Gender			
Male	47.7%	51.9%	57.1%
Female	52.3%	48.1%	42.9%
Ethnicity			
American Indian	0.4%	1.0%	0.5%
Asian	12.3%	23.1%	24.0%
Black	4.6%	4.8%	2.2%
White	77.1%	65.4%	68.9%
Multiracial	3.1%	1.9%	1.6%
Other	2.5%	3.8%	2.7%
Age			
21 or Under	3.6%	--	0.5%
22	44.7%	1.9%	--
23-24	36.0%	14.0%	--
25-29	11.4%	56.1%	49.7%
30-34	3.0%	12.1%	36.1%
35-39	0.7%	10.3%	8.2%
40-49	0.4%	3.7%	3.8%
50-64	0.2%	1.9%	1.6%
65 and Over	--	--	--

CITIZENSHIP

Table 13 examines how many graduates were studying chemistry and chemical engineering in the US on temporary student visas. This will help explain the discrepancy among advanced degree recipients vs. the ethnicity composition of new graduates overall. Again, due to small sample sizes year-to-year and that breakouts are relatively stable, Table 13 is based on a 5 year range of combined data (2009-2013) to improve reliability and stability.

A review of Table 13 reveals that foreign students do not come to the US for an undergraduate degree. Over the last 5 years, only 1.4% of chemistry graduates and 1.2% of chemical engineering graduates were foreigners who came to U.S. universities on a temporary visa to get a B.S./B.A. degree.

Data over the past five years confirms advanced degrees in chemistry and chemical engineering from American universities continue to command very high demand throughout the world. Among chemistry graduates, 17.2% of M.S. degrees and 22.6% of Ph.Ds. were awarded to graduates on temporary visas. Similarly, among chemical engineering graduates, 36.0% of master's and 24.8% of doctorate degrees were awarded to foreign students here on temporary visas.

Table 13. Citizenship of Chemistry and Chemical Engineering Graduates (2009-2013)

	Chemistry			Chemical Engineers		
	B.A./B.S. (n = 7,467)	M.S. (n = 541)	Ph.D. (n = 872)	B.A./B.S. (n = 805)	M.S. (n = 75)	Ph.D. (n = 145)
US Native	88.1%	71.5%	68.5%	91.6%	48.0%	68.3%
US Naturalized	7.4%	7.9%	3.8%	5.3%	6.7%	2.1%
US Perm. Resident	3.2%	3.3%	5.2%	1.9%	9.3%	4.8%
Temporary Visa	1.4%	17.2%	22.6%	1.2%	36.0%	24.8%

Caution: Some chemical engineering data are based on small samples and should be interpreted with care.

SCOPE AND METHOD

PURPOSE

The ACS Survey of New Graduates 2013 is part of an ongoing series of annual surveys conducted by the ACS on the employment and future plans of new chemistry and chemical engineering graduates. The primary purpose of the survey is to gather data on the starting salaries and occupational status of new chemists and chemical engineers who graduated during the 2012-2013 academic year. The survey covers bachelors, masters, and doctoral degree recipients.

SAMPLING AND DATA COLLECTION

The ACS Survey of New Graduates 2013 reflects responses from chemistry and chemical engineering college students graduating during the 2012 and 2013 academic year. Chemistry graduates were solicited

from universities containing ACS approved chemistry programs, while chemical engineering graduates were solicited from universities with ABET accredited chemical engineering programs.

Responses were solicited from 12,610 graduates having full U.S. mailing addresses, to complete either the paper or online version of the New Graduate Survey in 2013. Of those graduates 11,454 had valid addresses, and 2,035 usable responses were received. The ACS Office of Research and Brand Strategy (RBS) identified potential participants for this study by requesting the names and addresses of recent graduates from the Office on Professional Training (OPT), an internal department of ACS.

Survey questionnaires were mailed by first class mail in October and November 2013. A pre-notice postcard and two reminder postcards were also mailed. Data collection concluded early January 2014. Of the 11,454 contacted, a total of 2,035 usable responses were received, resulting in a 17.8% response rate. Respondents could complete the survey by mail (25.7%) and online (74.4%). The margin of error at 95% confidence is 2.0%.

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.Ds. by gender and another by employer. The totals will differ unless the number who did not indicate their gender is the same as the number who did not indicate their employer.

ESTIMATES OF MEDIAN SALARIES

Some median salary data presented in salary tables are based on small samples and subject to sampling error. As a precaution, median salary results in all table cells with fewer than 15 respondents are suspect to being unreliable and are not shown in this report. Instead "n.a." has been posted to these data cells and other tabled cells with fewer than 15 respondents.

In some instances this report uses multi-year samples to improve the validity and reliability of the sample data being reported. Nevertheless, caution should be used in interpreting results of any findings based on small samples.