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September/October 2013

New-Graduate Employment and Salaries

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ABSTRACT DEADLINE:
October 21, 2013

EDITORIAL:
C&EN and ACS: Your Professional Partners for Life

BY A. MAUREEN ROUHI

As an undergraduate chemistry major in the Philippines 40 years ago, I regularly visited the library to peruse *Chemical & Engineering News*. It was primarily to search for Ph.D. assistantships, because I wanted to go to graduate school overseas. Many *C&EN* readers of my age recall getting acquainted with *C&EN* in the same way. As we searched for jobs, we also got acquainted with *C&EN*'s unique content.

C&EN now has a lot of competition in advertising jobs, but it continues to be peerless in the unique content it brings to chemistry professionals. Anyone who is serious about doing well in the chemistry profession needs to know what goes on in the chemistry enterprise. No other source brings that information to readers as conveniently as *C&EN* does. No other news publication is as comprehensive in covering the science of chemistry and its related fields, the business of chemistry, and the regulations that govern the practice of chemistry and the use of chemicals.

An excellent example of the compelling content *C&EN* provides is the "New-Graduate Salaries" article, reprinted in this magazine on pages 8–10. This article originally appeared in the April 22, 2013, issue of *C&EN*.

Professionals are also tending more and more toward hyperspecialization, and chemists are no exception. *C&EN* offers a counterbalance to being hyperspecialized. It allows serendipity, which diminished with the loss of print journals. We used to browse print journals and come across unrelated work that just catches our curiosity. Web-based journals are less amenable to that. With *C&EN*, you always have the opportunity to see the hot topics, emerging trends, and rising stars in fields unrelated to yours. That knowledge enriches you, can expand your network, and can inform your research and career directions.

C&EN can also help you communicate the value of your chosen field. A lot of misunderstanding of chemicals pervades our society these days. We as chemists need to help our families, neighbors, and government officials differentiate between valid and questionable science. *C&EN* has been writing about many controversial topics in a way that can help you explain complex concepts to non-experts.

Subscribing to *C&EN* will give you access not only to *C&EN* the magazine, but also to the website, *C&EN* Online. If you can't subscribe, at least download the free *C&EN* Mobile app to access news, blogs, and job information. You can also purchase single copies of the magazine through the app.

The best way to get *C&EN* is to become a member of the American Chemical Society. As an ACS member you gain access to resources to advance your career. Through ACS meetings, you can grow your professional network. Through participation in ACS governance, you can hone leadership skills that you can apply to your home life or workplace. Through ACS volunteer opportunities, you can give back to your community. Through ACS technical divisions, you can strengthen your connections and expertise in your field of specialization. And through ACS member benefits of access to *C&EN*, scientific journals, and SciFinder, you ensure timely delivery of scientific information that's crucial to your work.

Your investment in ACS membership will yield high returns many times over, because ACS puts valuable career and professional advancement tools at your fingertips every day.

A. Maureen Rouhi *is the editor-in-chief of* Chemical & Engineering News, *the weekly news magazine of the American Chemical Society.*

ATOMIC NEWS

COMPILED BY CHRIS ZEIGLER

Source: ACS Office of Public Affairs Weekly PressPac, www.acs.org/content/acs/en/pressroom.html

Solar-powered **nanofilters pump in antibiotics** to clean contaminated water

Using the same devious mechanism that enables some bacteria to shrug off powerful antibiotics, researchers have developed solar-powered nanofilters that remove antibiotics from the water in lakes and rivers twice as efficiently as the best existing technology. Their report appears in the ACS journal *Nano Letters*.

David Wendell and Vikram Kapoor explain that antibiotics from wastewater find their way into lakes and rivers, with traces appearing in 80% of waterways. Those antibiotics foster emergence of new antibiotic-resistant bacteria, while harming beneficial microbes in ways that can degrade aquatic environments and food chains. Filters containing activated carbon can remove antibiotics from effluent at municipal sewage treatment plants, before its release into waterways. But activated carbon is far from perfect. So the scientists looked for a better technology.

They describe development and successful laboratory testing of capsule-like "vesicles" containing the very mechanism that enables bacteria to survive doses of antibiotics. This system pumps antibiotics out of bacterial cells before any damage can occur. Wendell and Kapoor turned it around, however, so that the system pumps antibiotics into the vesicles by creating a protein material capable of capturing antibiotics from bulk solution. That way, antibiotics can be collected and recycled or shipped for disposal. In addition to the pump, the vesicles contain a propulsion system driven by sunlight. The pump system could be adapted to clean hormones, heavy metals, and other undesirable materials from water, the scientists state.

Read more about the research: "Engineering Bacterial Efflux Pumps for Solar-Powered Bioremediation of Surface Waters," *Nano Lett.*, 2013, 13 (5), pp 2189–2193, April 13, 2013 (Web).

An environmentally friendly battery made from wood

Taking inspiration from trees, scientists have developed a battery made from a sliver of wood coated with tin that shows promise for becoming a tiny, long-lasting, efficient, and environmentally friendly energy source. Their report on the device — 1,000 times thinner than a sheet of paper — appears in the ACS journal *Nano Letters*.

Liangbing Hu, Teng Li, and colleagues point out that today's batteries often use stiff, non-flexible substrates, which are too rigid to release the stress that occurs as ions flow through the battery. They knew that wood fibers from trees are supple and naturally designed to hold mineral-rich water, similar to the electrolyte in batteries. They decided to explore use of wood as the base of an experimental sodium-ion battery. Using sodium rather than lithium would make the device environmentally friendly.

Lead author Hongli Zhu and other team members describe lab experiments in which the device performed successfully through 400 charge-discharge cycles, putting it among the longest-lasting of all sodium-ion nanobatteries. Batteries using the new technology would be best suited for large-scale energy storage applications, such as wind farms or solar energy installations, the report indicates.

Read more about the research: "Tin Anode for Sodium-Ion Batteries Using Natural Wood Fiber as a Mechanical Buffer and Electrolyte Reservoir," *Nano Lett.*, May 29, 2013 (Web).

$68 million
The cost of 1 gram of californium, the most expensive substance in the world – and the cost of the world's first all-diamond engagement ring.

29.76
The melting point in centigrade of gallium. This means a gallium spoon will melt in a cup of hot tea.

J
The only letter not appearing in the periodic table of elements. It is also not used in modern Celtic or Galician languages.

250
The number of grams of salt in the average human body. That's equivalent to half a pound or the mass of a large burrito.

5.6
The percentage of iron in the earth's crust, similar to the odds of a high school basketball player going on to play in the NCAA (2011 data).

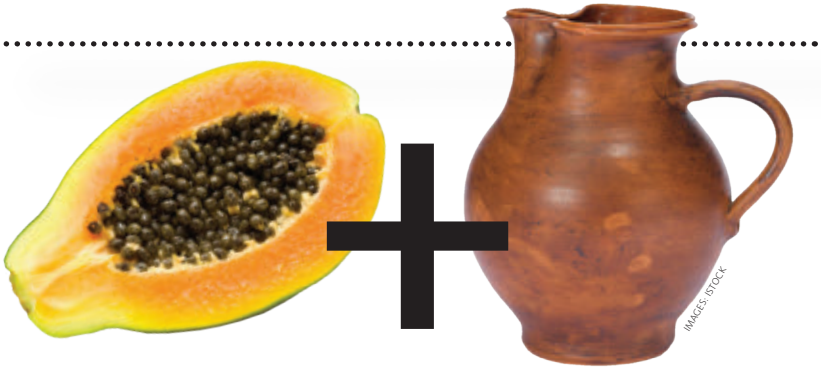
First dual-action compound **kills cancer cells, stops them from spreading**

Researchers are reporting development and successful lab tests of the first potential drug to pack a lethal one-two punch against melanoma skin cancer cells. Hit number one destroys cells in the main tumor, and the second hit blocks metastasis, according to their report in the journal *ACS Chemical Biology*.

Photodynamic therapy (PDT), which involves administering a drug that kills cancer cells when exposed to light, already is available. But PDT works only on the main tumor and has other drawbacks. Nathan Luedtke and his team set out to find an improved approach to PDT.

They describe successful tests in laboratory mice of one compound they synthesized, tetrakis-(diisopropyl-guanidino) zinc phthalocyanine (Zn-DIGP), which not only killed melanoma cells but also stopped them from metastasizing by blocking a key signal inside the tumor cells. This compound "provides the first example of a PDT agent that facilitates the photodynamic treatment of primary tumors while at the same time inhibiting the formation of metastatic tumors by a light-independent mode of action," the authors state.

Read the research article: "Photodynamic Agents with Anti-metastatic Activities," *ACS Chem. Biol.*, May 14, 2013 (Web).



Papaya-clay combo could cut cost of water purification in developing countries

An inexpensive new material made of clay and papaya seeds removes harmful metals from water and could lower the cost of providing clean water to millions of people in developing countries, scientists are reporting. Their study on this "hybrid clay" appears in the journal *ACS Sustainable Chemistry & Engineering*.

Emmanuel Unuabonah and colleagues explain that almost 1 billion people in developing countries lack access to reliable supplies of clean water for drinking, cooking, and other key uses. One health problem resulting from that shortage involves exposure to heavy metals such as lead, cadmium, and mercury, released from industrial sources into the water. Technology exists for removing those metals from drinking water, but often is too costly in developing countries. So these researchers looked for a more affordable and sustainable water treatment adsorbent.

They turned to two materials readily available in some developing countries. One was kaolinite clay, used to make ceramics, paint, paper, and other products. The other: seeds of the *Carica papaya* fruit. Both had been used separately in water purification in the past, but until now, they had not been combined in what the scientists term "hybrid clay." Their documentation of the clay's effectiveness established that the material "has a strong potential for replacing commercial activated carbon in treatment of wastewater in the developing world."

The authors acknowledge funding from the **Max Planck Institute of Colloids and Interfaces**, the **University of Potsdam**, and the **Alexander von Humboldt Foundation**.

Read more about the research: "Hybrid Clay: A New Highly Efficient Adsorbent for Water Treatment," *ACS Sustainable Chem. Eng.*, May 9, 2013 (Web).

NEW EVIDENCE **on how fluoride fights tooth decay**

In an advance toward solving a 50-year-old mystery, scientists are reporting new evidence on how the fluoride in drinking water, toothpastes, mouth rinses, and other oral-care products prevents tooth decay. Their report appears in the ACS journal *Langmuir*.

Karin Jacobs and colleagues explain that despite half a century of scientific research, controversy still exists over exactly how fluoride compounds reduce the risk of tooth decay. That research established long ago that fluoride helps to harden the enamel coating that protects teeth from the acid produced by decay-causing bacteria. Newer studies already found that fluoride penetrates into and hardens a much thinner layer of enamel than previously believed, lending credence to other theories about how fluoride works.

The report describes new evidence that fluoride also works by impacting the adhesion force of bacteria that stick to the teeth and produce the acid that causes cavities. The experiments — performed on artificial teeth (hydroxyapatite pellets) to enable high-precision analysis techniques — revealed that fluoride reduces the ability of decay-causing bacteria to stick, so that it is easier to wash away the bacteria by saliva, brushing, and other activity.

Read more about the research: "Reduced Adhesion of Oral Bacteria on Hydroxyapatite by Fluoride Treatment," *Langmuir,* 2013, 29 (18), pp 5528–5533, April 4, 2013 (Web).

Chapter Management and Reporting Made Easier

ACS "Student Chapters Online" Is a Boon for ACS Student Chapters!

BY NICOLE DI FABIO

All ACS undergraduate members and faculty advisors now have access to a new online student chapter management tool, *Student Chapters Online*, developed by ACS and available at **www.StudentChaptersOnline.acs.org**. Not only does this tool simplify the entire chapter report process, it helps chapters to better manage and track their day-to-day operations. It also provides a wealth of chapter activity ideas, a calendar of upcoming events and deadlines, and links to ACS resources that are especially useful to student chapters.

Until now there was no central location for chapters to store and access chapter information. Planning an activity or completing a chapter report was often a challenging and time-consuming process frequently involving many calls and inquiries to many people. *Student Chapters Online* will help you to easily determine:

- **"Who planned a particular event?"**
- **"How many people were involved?"**
- **"Who took photos of the event and where are they stored?**
- **"What events are scheduled for the next semester?"**
- **"Will anyone be available to help submit our year-end report in May?"**
- **"Who was last year's chapter president?"**
- **"What award did our chapter win last year?"**
- **"What are other chapters doing?"**

Easy login

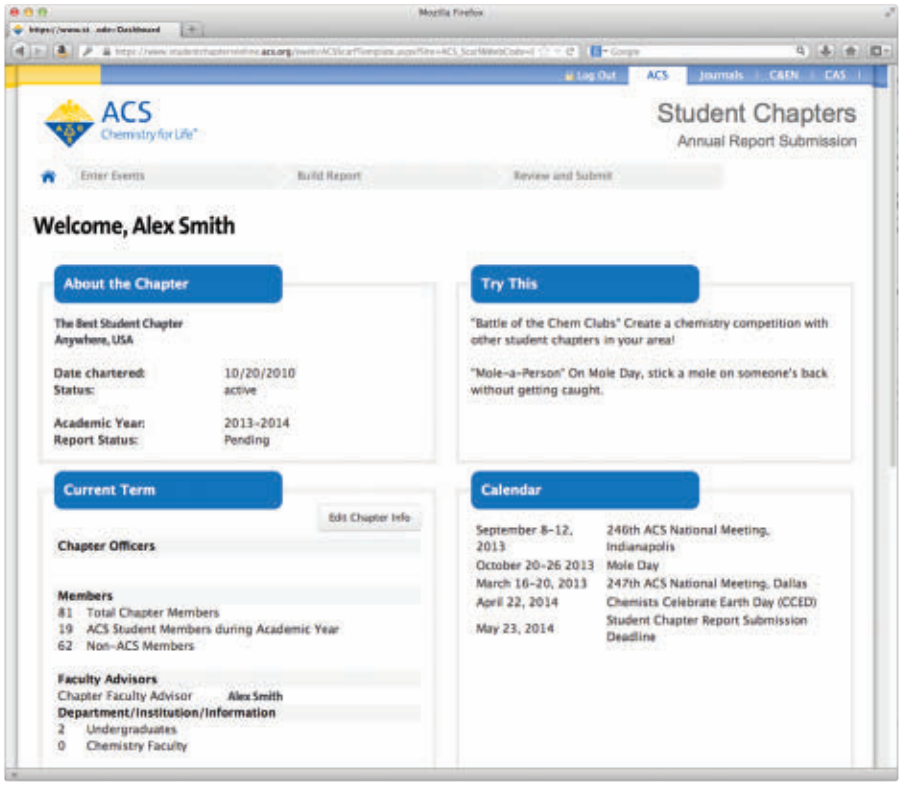
Students and faculty advisors can access *Student Chapters Online* through their ACS ID. Chapter members who are not ACS members will not have access to *Student Chapters Online*.

Manage information more easily

Student Chapters Online is very user-friendly, and it also offers a variety of advanced features to benefit chapter members and faculty advisors. After logging into the system you'll be taken to the user dashboard. This dashboard will display chapter information, such as the names of presidents, vice presidents, other officers, and faculty advisors, member counts, local section contacts, and much more. These chapter data will be editable throughout the year.

Add events as you go!

All chapters will be required to use *Student Chapters Online* to prepare their annual chapter report, which will be due at the end of the academic year, in May 2014. Previously, many chapters waited until the end of the academic year to complete their chapter report, ultimately submitting it minutes before the midnight deadline. This eleventh-hour effort required excellent record keeping or great memory recall. Fortunately, the new tool allows students to document events as they happen and to plan future events.



All chapter members will have documentation they can access throughout the year.

After your chapter submits a report, the chapter will receive expert feedback from a team of experienced chapter advisors who review every report, and you'll also be considered for a chapter award.

Share your successes and access new ideas

ACS student chapters are typically composed of über-involved and dedicated chemistry students. Each year these students submit reports brimming with information about new and innovative events and activities. Until now, only a handful of people had access to this information, but things have changed. *Student Chapters Online* provides a "sharing" function that you can use to nominate noteworthy chapter events. ACS staff will review the nominations and then post them on the student dashboard, where they will be visible to all students and faculty who sign into the system.

View your award level and reviewer feedback

Submitting a chapter report not only helps your chapter to maintain active status in ACS, it clearly details to ACS and chapter members, faculty, and the chemistry department how the chapter has contributed chemistry to your community while demonstrating professional development skills. Chapter records and the resulting chapter report will be much more accurate. The whole reporting process will be easier, faster, and less stressful for students and faculty advisors. Once your chapter reports are reviewed and ranked, chapter officers can view the rankings and reviewer comments.

Share photos

You'll be able to raise your chapter's visibility by submitting high-resolution photos and other supplementary materials with your chapter report. Supplemental materials, including photos, flyers, and newspaper articles, help online faculty reviewers to better understand your chapter activities and events. Student chapters can now look forward to increased storage space for uploading high-resolution photos that can be used on *inChemistry* covers and in our awards ceremony video, which provides recognition and great PR for your chapter.

Student Chapters Online will help you to better manage your chapter and the streamline the chapter report process. Check it out at **www.StudentChaptersOnline.acs.org**.

Nicole Di Fabio *is a senior education associate in the ACS Undergraduate Programs Office.*

New-Graduate Salaries

Unemployment Dropped Slightly in 2012 — But So Did Salaries for Those Who Found Jobs, ACS Survey Shows

BY SUSAN R. MORRISSEY

REPRINTED FROM *CHEMICAL & ENGINEERING NEWS*, APRIL 22, 2013, VOLUME 91, ISSUE 16, PP. 47–50.

For newly minted graduates in chemically related fields, 2012 was a better year to find a job than previous years, as the unemployment rate for those looking for work fell from 13.3% in 2011 to 12.6% in 2012.

Despite the slight drop in unemployment, median starting salaries for new Ph.D. and master's degree recipients also dropped and those for bachelor's earners stayed flat. These findings come from the annual American Chemical Society survey of new graduates in chemistry and related fields.

Gareth S. Edwards of the ACS Department of Research & Member Insights conducts the survey under the guidance of the ACS Committee on Economic & Professional Affairs. The 2012 survey was sent to 12,132 recent graduates in early October 2012, and data were collected until January 2013. In all, the new grads returned 2,012 usable responses for a response rate of 16.6%. The respondents can be divided into several categories — degree level, for instance, or field of study, gender, experience level, or type of employment. For some of these groups, the number of responses was small and not necessarily representative of the wider pool of chemistry graduates in a given group.

Of the 2012 respondents, 85.1% were newly minted bachelor's degree holders, 6.9% held new master's degrees, and 8.0% had just completed a Ph.D. Among the bachelor's degree recipients, the top three fields of study were general chemistry (50.2%), biochemistry (30.5%), and chemical engineering (8.3%). For master's degree holders, a quarter of respondents earned a general chemistry degree, 18.1% a biochemistry degree, and 13.8% an analytical chemistry degree. At the Ph.D. level, 20.5% earned an analytical chemistry degree, 13.7% an inorganic chemistry degree, and 13.7% an organic chemistry degree.

Percentage of respondents who were unemployed job seekers in 2012:

12.6

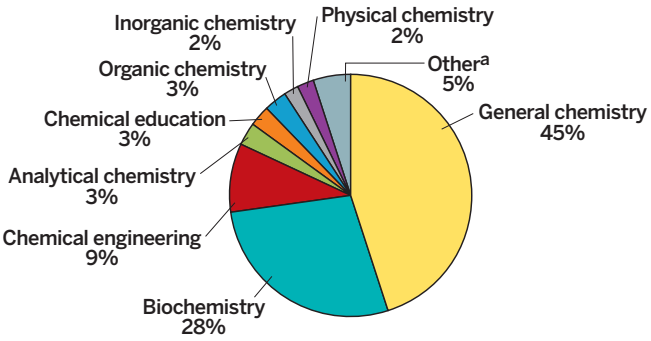
Percentage of respondents who are female:

49.9

Percentage of respondents who consider themselves to have a disability:

1.5

The highest degree for most respondents was in general chemistry or biochemistry.



Respondents = 2,012

NOTE: Of the respondents, 85.1% earned new bachelor's degrees, 6.9% earned master's degrees, and 8.0% earned Ph.D.s. **a** Includes respondents who selected agricultural/food chemistry, environmental chemistry, forensic chemistry, materials science, medical/pharmaceutical chemistry, and polymer chemistry as field of highest degree, as well as those who opted not to select a field.

Median age of 2012 survey takers:

22 for bachelor's

26 for master's

30 for Ph.D.s

Top method for finding a job:

Electronic tools

Median 2012 starting salary for inexperienced grads:

$40,000 for bachelor's

$48,000 for master's

$80,000 for Ph.D.s

Percentage of employed Ph.D.s who went to work in academia:

54.5

Percentage of respondents who held temporary visas:

4.4

When all levels are combined, chemical engineering accounted for 8.6% of degrees.

Although the data show a small drop in the overall percentage of unemployed job seekers, the size of that decrease varied by degree level. For Ph.D. graduates, the overall unemployment level reported was 8.1%, with 7.5% of respondents saying they were actively looking for work as compared with 8.8% looking in 2011. And for bachelor's degree earners, nearly 18% of respondents were unemployed and 13.4% were actively job hunting, down from 13.6% in 2011. The big change was among those earning master's degrees: 11.0% reported being unemployed. But only 9.6% were seeking employment in 2012, far below the 17.8% who were looking in 2011. However, the number of respondents in this category was small.

Another sign that the job market may be improving is that the number of graduates pursuing advanced study was down slightly for bachelor's degree earners, meaning a few more graduates were opting to enter the job market. Of bachelor's degree earners, 39.1% said they planned to continue their education immediately after receiving their degree. This is down from 41.1% in 2011. But the statistics for those earning a master's degree in 2012 can be interpreted less optimistically. A third of respondents in this group said they planned to continue their studies, up from 22.0% in 2011.

The top fields for those with bachelor's degrees opting to continue their studies include chemistry (30.7%), medicine (25.5%), and pharmacology (12.8%). Two-thirds of master's degree recipients said they planned to study chemistry.

The percentage of Ph.D.s who took a postdoctoral position after completing their degree was down. Some 40.6% of respondents indicated they would be doing a postdoc, whereas in 2011, 46.9% pursued this option.

Regardless of work experience, for those who decided to enter the job market and found a job, the median starting salary for most categories in 2012 was flat or down from 2011 values. The largest change was for new Ph.D.s, who saw starting salaries drop to $75,000 in 2012 from $85,000 the previous year. For those earning master's degrees, the reported median starting salary fell from $55,000 in 2011 to $49,500 in 2012. Starting salaries for bachelor's degree earners held flat at $40,000.

The survey data also provided mixed results about the correlation between median salary and experience levels. At the bachelor's degree level, experience did not matter, whereas for hires with new master's degrees, more experience meant more money in their paycheck. The outlier here is the reported

WHERE THE JOBS ARE
Nearly half of respondents were hired into academia

	B.A./B.S.	M.S.	PH.D.
Academia	41%	51%	55%
Chemical industry	21	20	17
Pharmaceuticals	5	9	2
Analytical/ clinical labs	10	2	6
Other nonmanufacturing	16	14	9
Government	7	4	11
Self-employed	2	0	0

NOTE: Percentages are for all responding 2012 graduates with full- or part-time employment. Numbers may not sum to 100% because of rounding. Table contains some data derived from sample sizes too small to generalize.

ADVANCED STUDIES BY TOPIC
Chemically trained bachelor's continued studies in a variety of areas

Field of Further Study	B.A./B.S.
Chemistry	**31%**
Other sciences	**31**
Pharmacology	13
Biochemistry	8
Life sciences	4
Other/math	7
Engineering	**4**
Chemical/biochemical	3
Other	1
Health	**29**
Medicine	26
Dentistry	4
Other[a]	**5**

NOTE: Percentages are of respondents who were continuing advanced studies full-time after earning a bachelor's degree in a chemical field in 2012. Numbers may not sum to subtotals, or total 100%, because of rounding. **a** Includes business management, education, and law.

SALARIES BY PRIMARY WORK FUNCTION
Men's salaries were higher than women's in all functions

$ Thousands	Men	Women	All
Development/design	$60.1	$55.0	$60.0
Management	58.0	41.5	55.0
Professional services	54.5	53.8	54.5
Research	45.0	40.0	42.0
Production/quality control	45.0	36.0	40.0
Teaching	39.7	37.5	39.0
Other	44.5	34.8	40.0
ALL	$49.8	$40.0	$42.5

NOTE: Median salaries for responding 2012 bachelor's degree graduates with full-time permanent employment.

STARTING SALARIES OF INEXPERIENCED GRADS
Constant-dollar salaries for M.S. degree earners grew slightly, while those for Ph.D.s and bachelor's degree earners fell

	B.A./B.S.		M.S.		PH.D.	
$ Thousands	Current	Constant	Current	Constant	Current	Constant
2005	$37.0	$37.0	$52.0	$52.0	$75.0	$75.0
2006	38.0	36.8	48.8	47.3	66.5	64.4
2007	40.2	37.9	52.0	49.0	77.0	72.5
2008	40.0	36.3	52.0	47.2	80.0	72.6
2009	38.0	34.6	60.0	54.6	76.3	69.4
2010	40.0	35.8	45.0	40.3	75.0	67.2
2011	40.0	34.7	46.7	40.6	85.0	73.8
2012	40.0	34.0	48.0	40.8	80.0	68.1

NOTE: Median annual salaries of responding new graduates with full-time permanent employment and less than 12 months of technical work experience prior to graduation. Constant dollars are 2005 dollars and are calculated using the Consumer Price Index.

BACHELOR'S SALARIES BY EMPLOYER SIZE

Biggest firms were the highest payers in 2012

Size of Employer	Median Salary ($ Thousands)
Fewer than 50 employees	$36.5
50–99	35.0
100–499	39.0
500–2,499	36.0
2,500–9,999	46.9
10,000–24,999	38.0
25,000 or more	56.0

NOTE: Median salaries of responding 2012 bachelor's degree graduates with full-time permanent employment.

CHEMISTS VS. CHEMICAL ENGINEERS

Chemical engineering grads were less likely to pursue advanced degrees and were better paid than chemists

	B.A./B.S.		M.S.		PH.D.	
	Chemists	Chemical Engineers	Chemists	Chemical Engineers	Chemists	Chemical Engineers
BY EMPLOYMENT						
Full-time	31%	65%	52%	30%	44%	65%
Part-time	10	4	6	10	6	0
Further study	41	13	33	30	41	35
Unemployed	18	18	10	30	9	0
Seeking	13	14	8	30	9	0
Not seeking	4	4	2	0	1	0
BY EMPLOYER						
Academia	43	17	52	50	60	25
Industry	49	76	45	50	29	70
Government	7	7	4	0	12	5
Self-employed	2	0	0	0	0	0
BY GENDER						
Women	53	24	48	60	44	26
BY CITIZENSHIP						
Temporary visas	1	2	14	46	28	35
SALARIES ($ thousands)						
Full-time permanent	$36.2	$65.0	$49.5	$75.2	$68.8	$93.0

NOTE: Median salary data for all responding 2012 graduates regardless of experience. Numbers may not sum to subtotals, or total 100%, because of rounding. Table contains some data derived from sample sizes too small to generalize.

salaries for fresh Ph.D.s. Those starting jobs with less than 12 months of experience reported earning $80,000, those with 12–36 months of experience reported earning $64,200, and those with more than 36 months of experience, $74,000. It's important to note, however, that the response rate for 2012 Ph.D.s was lower than previous years and therefore may not be representative.

The size of companies hiring new graduates also affected salaries. Bachelor's degree holders who work for large companies with more than 25,000 employees earned $56,000. The next highest earners, with a median salary of $46,900, were bachelor's degree holders hired by firms with 2,500 to 9,999 employees.

The gender of graduates with less than a year of experience also affected starting salaries. Male bachelor's degree recipients indicated that their median salary was $43,000, whereas for women, the median salary was $36,500. Similarly for Ph.D.s, the median salary for men was $81,300, and for women it was $74,000. Women who earned master's degrees, however, reported earning more than their male counterparts — $48,000 compared with $45,000.

Inexperienced bachelor's degree holders who found work in industry earned more than those who took jobs in academia and the government. The median salary for new hires in industry was $40,000 in 2012 compared with $36,000 and $38,500 for new employees in academia and government, respectively.

Having a chemical engineering degree also translated to higher earnings. The median starting salary of Ph.D. chemical engineers was $93,000 in 2012, some 35.2% more than for Ph.D. chemists. And for those who earned a bachelor's degree, the median salary was $65,000, 80% more than for chemists with a bachelor's degree. There were insufficient data for chemical engineers earning master's degrees.

For all respondents, the most popular technique to find a job was using electronic media such as Internet job boards. Other common job-finding methods included placement services, informal channels, and faculty advisor help.

When it comes to liking one's job, those who completed advanced degrees reported being more satisfied. For example, 70.3% of bachelor's degree recipients felt professionally challenged in their jobs, while 79.6% of master's degree holders and 86.2% of Ph.D.s felt challenged.

Similarly, when it comes to feeling like their education relates to the field in which they work, 75.3% of bachelor's degree earners agreed, but 92.7% of master's earners and 95.2% of Ph.D. holders agreed. And when asked if their training and education are commensurate with their job, 70.0% of bachelor's degree earners agreed, as compared with 84.4% and 90.3% of master's earners and Ph.D. holders, respectively.

But when it comes to feeling that their jobs are what they expected them to be when they began their studies, only 62.6% of Ph.D.s reported understanding exactly what those positions would entail. iC

Susan R. Morrissey *is the assistant managing editor for government and policy at* Chemical & Engineering News. *She holds a B.A. in chemistry from Franklin & Marshall College and a Ph.D. in chemistry from Texas A&M University.*

ACS Chemistry for Life™

SCI America

AIChE

Call for Applications

SCI SCHOLARS

Summer Industrial Internship Program for Undergraduates

Summer 2014

The Society of Chemical Industry (SCI) is pleased to offer the **SCI Scholars Program,** which is designed to introduce exceptional chemistry and chemical engineering students to careers in chemical industry. Selected students will become SCI Scholars and participate in one of many prestigious 10-week industrial internships during the summer of 2014.

BENEFITS:

- Industrial experience
- Generous award—the stipend is in the $6,000–10,000 range for the 10-week internship
- Certificate and $1000 travel award to participate in a scientific meeting
- SCI Scholars will nominate a high school chemistry teacher for recognition and a $1000 award

REQUIREMENTS:

- Current sophomore or junior
- Chemistry or chemical engineering major
- Minimum GPA of 3.5
- U.S. citizen or permanent resident

SCI Scholars will be selected based upon the strength of their application, statement of interest, and letters of recommendation.

To see detailed information and apply, visit www.acs.org/sci

Deadline to apply is December 14, 2013

Communicating with Others about Your Research

Why It's Essential to Distill Your Message and Speak Simply

BY DOUG DOLLEMORE

We live in a world filled with lingo, jargon, and gobbledygook. Every occupation — from actors to Zamboni drivers — seems to have a specialized language that is understandable to only those "in the know."

Alas, chemistry students, professionals, and other scientists aren't immune to this phenomenon. Just browse through a few issues of any ACS journal or an ACS national meeting technical program and you'll encounter many concepts like "Hopf map of quaternions" or "atom transfer radical addition." Such words and phrases may be readily comprehensible to you and other chemists, but if you use them among your non-scientist friends and neighbors, you might as well be speaking Návi, Sindarin, or some other fantasy language.

Just imagine asking for a glass of fruit juice in a restaurant this way: "In a vesicle made from silicates, add the acidified liquid containing 2-hydroxypropane-1,2,3-tricarboxylic acid from *Citrus reticulata* to solidified particles of dihydrogen monoxide…" If the server gets that order right, you'd better leave a big tip!

Of course, that is an absurd example, but it does illustrate the challenge you face when trying to explain your research to the "real world" in a way that non-scientists can understand — and as a result, appreciate the work you do. And in that real world, you're going to need a sharp, clear, and concise message to make your case during job interviews or when you're seeking funding from potential investors or government officials. And, yes, you might even have to take your description down a few notches when you talk to other scientists who aren't familiar with the terminology in your specific field.

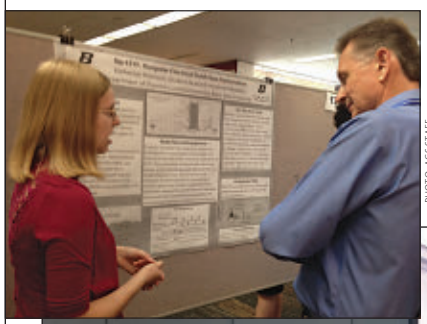


PHOTO: ACS STAFF

PHOTO COURTESY OF OUACHITA BAPTIST UNIVERSITY

TOP: **Strive to explain your research in a way that your audience can understand and appreciate.**

BOTTOM: **Students from the Ouachita Baptist University (Arkadelphia, AR) chapter participated in the Speak Simply poster contest at the 245th ACS National Meeting in New Orleans, and four received awards for their presentations.**

The art of distillation

So how can you bridge this gap? How can you describe what you do and why it is important in a way that non-scientists can appreciate and embrace as passionately as you do? Surprisingly, the answer comes right out of the lab. Speaking simply boils down to distillation, one of the oldest and most commonly used purification methods in chemistry. But instead of liquids, we want you to distill your words and extract the essence of your *research* in a way that virtually anyone can grasp.

For starters, imagine that every word you say creates a jigsaw puzzle in a listener's mind. If they understand what you're saying, all of the pieces in their head will be face-up and they can easily put the puzzle together and comprehend what you're talking about.

But if you use words and phrases they don't understand, most — if not all — of the pieces will appear blank. And while they might try to piece together what you're describing, ultimately they'll likely give up and you'll see that ever-so-fun blank look sprout on their faces. So your first task is to find a common language so that you can share the common good that chemists do every day.

Your overall goal when communicating with others about your research is to put a human face on chemistry. And one of the best ways to do that is to tell a story. Stories, parables, and folktales are a universal way to share information and ideas. Better yet, stories stick in listeners' heads like cotton candy to a child's fingers. Your story doesn't have to be elaborate, but it should convey a sense of what is new, surprising, exciting, or mysterious about your research.

I once interviewed a chemist who told me

Become an ACS Chemistry Ambassador
Share the Chemistry… Imagine the Reaction!

Chemists help solve some of the world's biggest challenges and improve people's lives through the transforming power of chemistry. But not everyone knows that. By becoming a Chemistry Ambassador, you can help educate people about the importance of chemists and chemistry, while taking part in community activities that you find engaging and fulfilling. Go to www.acs.org/chemistryambassadors. iC

a great story about how he got started on a particular project. He was intrigued by how mussels tenaciously cling to piers and sea rocks. So he wondered if he could make a glue that was just as strong. Well, like many scientific efforts, it took a bit more time and effort than he thought. But one day he realized the tofu he was eating for lunch had many of the same proteins that the mussels have in the secretions they use to cling to the rocks. Ultimately, based on this eureka moment, he developed an environmentally friendly, soy-based glue that is now being used in the plywood industry.

Who would listen?

Now, you might say that stories like the one above are few and far between. I don't think so. I suspect you, too, can tell a story about your research that resonates and is memorable.

When you tell your story, be conversational and use examples, metaphors, or analogies that are familiar to your listeners. Keep the idea of the jigsaw puzzle in mind as you speak.

Still don't think it can be done? Well, at the 245th ACS National Meeting in New Orleans, we challenged students who presented at an undergraduate research poster session to describe their work in a simple way that someone who isn't a scientist would understand and appreciate. In essence, we were asking them to become Chemistry Ambassadors (see box) and join nearly 9,000 of their fellow ACS members in helping to educate people about the importance of chemists and chemistry.

Tips from the winners

More than 50 students participated in the "Speak Simply" poster contest, and 16 of them won. The winners communicated simply, distilling their stories down to their very core. And their advice on how to do it yourself is well worth heeding.

Take Ryan James, a 2013 graduate of Ouachita Baptist University (OBU) in Arkadelphia, AR, for instance. "My research dealt with Ewing's sarcoma, a very aggressive pediatric bone cancer," he says. "No parent wants to see their child go through something like this. Sometimes we can forget about the human element when we're doing this type of research. But to the public, the human element is generally all they care about: how this research will benefit *them*. Basically, I wanted these judges to walk away knowing that we have a viable option to help cure these individuals of this very aggressive cancer without the dangerous treatment options available now such as chemo, radiation, or surgery."

"Always think about the consumer," James suggests. "Just like on a TV commercial, which tells you a bit about the product but then spends the majority of its time explaining how it is going to benefit you… That's what I like to think of when people walk up to me."

Kelsey Willis, an OBU senior, suggests reviewing your presentation with a non-scientist. "It's the best way to determine the parts of your talk that contain too much scientific jargon," she says.

Shantell Rolle is a junior at Florida International University in Miami whose winning explanation described a way to use essential oils from the Brazilian pepper tree to kill mosquitoes responsible for spreading dengue fever. Rolle urges her fellow undergraduates to avoid focusing on the nitty-gritty details of their research. Instead, she advises, answer the following questions: Why is your work important? What is your ultimate goal? How will this make a difference in the world?

And if all else fails, you can always try following Kevin Romero's approach. The junior at Linfield College in McMinnville, OR, suggests eliminating science terminology from your explanation entirely.

"Every time you reference science words and phrases, you're going to lose a little bit of their interest," he says. "You're getting into a realm that they're unfamiliar with. So you have to find a way to convey your passion for the science without actually mentioning it. You have to find a middle ground. It may take you out of your comfort zone, but it closes the gap that your listeners have to bridge."

The bottom line is: no matter how you do it, try. Speaking simply and distilling your message down to its essential core will make a difference in your career and, ultimately, in the lives of others. iC

ACS Undergrad Speak Simply Poster Contest Debuts in New Orleans

Fifty-five students participated in a Speak Simply contest during the Undergraduate Poster Session at the 245th ACS National Meeting & Exposition in New Orleans earlier this year. The judges, who were distinguished chemists and ACS staff members, chose 16 winners, who each received a $25 gift card.

Shapnil Bhuiyan, Wayne State University, Detroit, MI
Carly Engel, College of the Ozarks, Lookout, MO
Samantha Hughes, Central Connecticut State University, New Britain
Ryan James, Ouachita Baptist University, Arkadelphia, AR
Hollyn McCarty, Ouachita Baptist University, Arkadelphia, AR
Samantha Monk, Austin Peay State University, Clarksville, TN
Kiley Morgan, University of North Georgia, Dahlonega
Joshua Olexa, St. Mary's College of Maryland, St. Mary's City
Christa Riggs, Ouachita Baptist University, Arkadelphia, AR
Shantell Rolle, Florida International University, Miami
Kevin Romero, Linfield College, McMinnville, OR
Stephanie Steiner, Whitman College, Walla Walla, WA
Fred Tomlin, Whitman College, Walla Walla, WA
Greg Trieger, St. Mary's College of Maryland, St. Mary's City
Kelsey Willis, Ouachita Baptist University, Arkadelphia, AR
Nicole Yorden-Lopez, Pontifical Catholic University of Puerto Rico, Ponce

Doug Dollemore *is a senior science writer in the ACS Office of Public Affairs.*

The Adventure of a Lifetime

My Experience with the Society of Chemical Industry (SCI) Scholars Program

BY BAILEY JACKSON

In 2012, I was honored to be chosen as a SCI Scholar and offered the opportunity to work at Milliken & Company in Spartanburg, SC. The idea of moving 1,300 miles away to a new city and state was overwhelming, but I also knew I was in for the adventure of a lifetime.

For a start, I drove 20 hours to South Carolina, used my GPS to find my apartment complex, and signed the lease contract. Milliken directed me to this particular complex because it is where they typically advise their interns to stay. I was able to rent a fully furnished apartment, shared with two others, for two and a half months, instead of the usual six- to twelve-month lease. Even better, it was a short five-minute drive to work every morning.

A beautiful mission

I worked at their headquarters in the research department, under the direction of Deidre Sandrock, a Ph.D. associate. The project to which I was assigned, titled "Formulation of Silicone Elastomers for LED Encapsulants," was both challenging and rewarding. I was able to complete my objectives by the deadline and produce a viable product formulation for the company's use. At the same time, I was privileged to meet and work with a number of talented and driven Ph.D. and technical associates. Teamwork was a major component of my day-to-day work, as we each endeavored to find creative solutions to problems and shared both our successes and failures.

Technical skills

My project dealt with a number of techniques and skills that I had learned previously, as well as new tools that I learned while at Milliken. I had performed many of the activities while doing research at college the two summers before, including inert atmosphere synthesis procedures, purification by distillation, and product analysis by nuclear magnetic resonance (NMR) spectroscopy and gas chromatography/mass spectrometry (GCMS). Some of the new techniques I learned included large-scale synthesis and product physical testing like refractive index and ultraviolet-visible (UV-vis) solid state absorption.

To succeed, I had to draw on knowledge from a wide variety of chemistry areas. There were organic synthesis and purification techniques, coupled with inorganic catalysis and analytical techniques, supported by physical chemistry. I was astonished, however, at how quickly I was able to apply and build on my knowledge in order to understand the very specific area of silicone elastomers. This experience showed me the importance of a solid background in all areas of chemistry in helping to prepare you for real-life industrial projects.

Personal skills

While chemistry and lab skills were essential to performing well in this internship, they were not the only requisites. Throughout the summer, I was required to give presentations about my progress toward my project objectives. I also honed my public speaking and presenting skills, not to mention my knowledge of PowerPoint, in order to give clear and concise information about my project.

The biggest challenge was the final presentation at the Milliken Summer Challenge. The CEO, Joe Salley, along with the heads of all the divisions, all of the interns, and their bosses — about 100 people in all — were in the audience. But the size of the audience was not my biggest concern; it was narrowing down my information to a six-minute window in terms that everyone, even those without a chemistry background, could comprehend. I learned that one of the true challenges of being a chemist or science specialist is being able to communicate information succinctly and effectively to those from non-science backgrounds.

The business of interning

An important business principle I experienced was the internal, day-to-day functioning and planning of an industrial chemical company. Most presentations at meetings focused on product creation and testing results, not to mention future avenues of research and market competition. Much of the discussion of ongoing research centered on products currently on the market, and how Milliken could meet or exceed the standard set by those products.

Getting to know how the chain of command worked was also

SCI Scholars Program Internships
Summer 2013 Internships and Locations

Air Liquide	Dallas, TX
Air Products	Houston, TX, and Allentown, PA
Albemarle Corporation	Baton Rouge, LA
Carus Corporation	LaSalle, IL
Chemtura Corporation	Perth Amboy, NJ
Chevron Phillips	Pasadena, TX, and Baytown, TX
Croda Inc.	Edison, NJ
Dow Chemical Company	Freeport, TX
Dow Corning Corporation	Midland, MI
DuPont	Wilmington, DE
Eastman Chemical Company	Kingsport, TN
ExxonMobil	Baytown, TX, and Baton Rouge, LA
Honeywell/UOP	Des Plaines, IL
Honeywell/PMT	Chesterfield, VA
LANXESS	Pittsburgh, PA
Milliken & Company	Spartanburg, SC
Momentive	Stafford, TX
Nalco	Naperville, IL
Styron Company	Midland, MI
WR Grace	Columbia, MD

an interesting learning experience. I was introduced to a wide variety of associates at Milliken who each had their own place and responsibilities within the organization. The technical associates tended to be younger scientists with either bachelor's or master's degrees. Research chemists and upper-level research managers tended to have doctorate degrees. What I found most intriguing was the ease of communication between all of the different levels. There were times when management lived up to their stern and serious stereotype, but most often they would rather trade jokes or sit down for a good chat.

PHOTO COURTESY OF BAILEY JACKSON

Deidre Sandrock, research chemist at Milliken & Company, and the author examine a silicone elastomer.

About the SCI Scholars Program

The Society of Chemical Industry (SCI), America International Group (AIG), ACS, and the American Institute of Chemical Engineers (AIChE) started this summer internship program in 2008 to introduce chemistry and chemical engineering students to careers in the chemical industry. In addition to the paid internship, SCI Scholars receive $1,000 for professional travel and nominate a high school chemistry teacher for a $1,000 award. An average of 30 paid internships are offered each summer to those with chemistry and chemical engineering backgrounds. iC

After 5 p.m.

The work I did for my internship was truly interesting and exciting, but my time in South Carolina was not totally spent in the lab. I got to know many of my co-workers and other interns throughout the company on a personal level. They helped me get to know the Spartanburg area and experience the friendly atmosphere for which the South is known.

I took part in a number of activities — including hiking, visiting Civil War sites, exploring the cities, and attending music festivals. I also tried a wide variety of food during my time there, and the fresh, homemade peach ice cream was a particular treat. However, it was the friends I met on these adventures who made my summer experience so memorable.

Into the future

Being a SCI Scholar decidedly helped to shape my plans for after graduation. Before this summer, I was tentatively planning on attending graduate school to get my master's in chemistry. After I finished my internship, however, I decided that I wanted to earn a Ph.D. in chemistry because of my love for research, as well as my sense of obligation to society. I realized that if an industrial company as large and prominent as Milliken & Company can have the commitment to strive to make the world a better place, then I can do no less.

The SCI internship helped me gain an appreciation and understanding of what a research chemist does day-to-day in an industrial company. I gained and practiced many skills, both technical and interpersonal, that will definitely benefit me in my future endeavors.

In short, I had a fantastic experience that gave me much professional and personal satisfaction. If you are an undergraduate and are considering an industrial career, I recommend taking a leap out of your comfort zone and experiencing an industrial internship — whether 10 or 1,300 miles away. Who knows what adventures you will find? iC

Bailey Jackson *is currently pursuing a Ph.D. in inorganic chemistry at the University of Illinois Urbana-Champaign. She graduated from Augustana College (SD) with a B.A. in chemistry.*

The Economics of Graduate School

Does Earning a Graduate Degree Make Financial Sense for You?

BY JEFFREY KNOX

Today, more people than ever are earning college degrees. While few dispute the perceived social and economic benefits that come from higher education, the decision of whether to enter the workforce immediately or attend graduate school is a complex, life-changing decision.

Each year, approximately 35–45% of new chemistry graduates start a Ph.D. program the following year, according to a recent ACS New Graduates Survey. The rationale for attending graduate school should be based on one's career and life goals, rather than just a desire to stay in school or a sense of obligation. It's important to weigh the potential cost and earnings associated with the decision before committing time and energy to pursue another degree.

Think of graduate school as an investment, and analyze its potential return (i.e., the return on investment, or ROI). Basically, if the payoff in the future isn't worth the price you pay, why invest? Such an analysis requires a few assumptions and generalizations, and a critical look at anecdotal evidence as well as statistics. For example, just as normal curves have outliers, there will always be cases where college dropouts become CEOs or well-published professors with Ph.D.s are barely making enough to support their families.

The U.S. Bureau of Labor Statistics (BLS) publishes an annual Current Population Survey that quantifies the financial benefits of earning a more advanced degree. A broad sampling of the U.S. population reveals that, in general, a higher level of educational attainment yields significantly greater future earnings and a lower likelihood of unemployment. Level of education, employment sector, and length of experience are the three most influential correlates of salary. Educational payoff also tends to be greatest at the highest degree levels. In 2012, for example, those with professional degrees registered median weekly earnings of $1,735 and an unemployment rate of 2.1%. Among those with bachelor's degrees, the numbers were $1,066 and 4.5%, respectively, and among all workers, the corresponding averages were $815 and 6.8%.

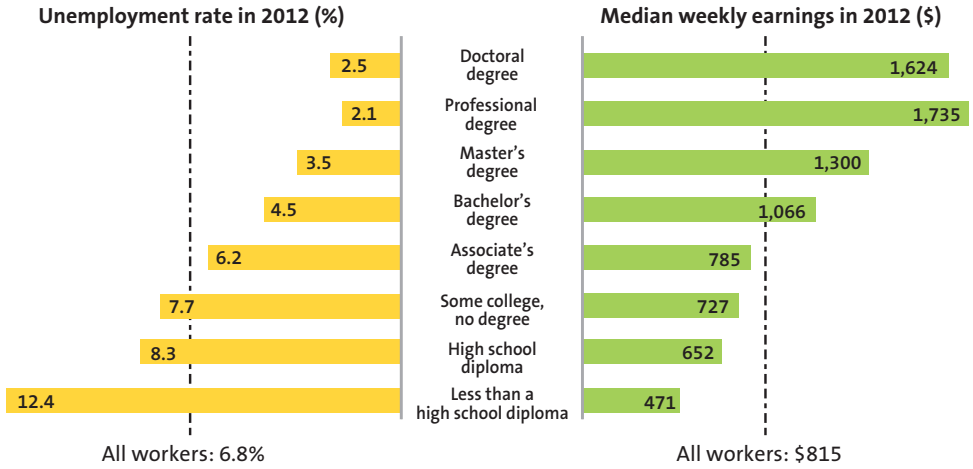
In its "Education Pays" report, the College Board publishes a comparison of earnings ratios. Compared with a high school graduate, the median earnings for a person with a bachelor's degree are 1.66 times greater. Obtaining a professional degree results in an income that is 1.65 times that of a college graduate. From a strictly financial standpoint, getting a graduate degree pays off down the road. But as I'll explain a little later, your calculation may be a bit more complicated than that.

Employment potential

From an employment perspective, a graduate degree in chemistry also proves worthwhile. According to a 2013 study entitled "Hard Times" by Anthony Carnevale, director of the Georgetown University Center on Education and the Workforce, those with B.S. chemistry degrees registered the fourth-lowest unemployment rate among all college majors, at 5.8% for recent graduates. The study also disclosed unemployment rates of 5.6% and 2.4% for experienced graduates and graduate degree holders in chemistry, respectively.

In the most recent ACS survey of new graduates in chemistry and related fields, published in the April 22, 2013, edition of *C&EN* and reprinted on pages 8-10, the median starting salary in 2012 for new graduates in chemistry was $40,000 for a bachelor's degree holders and $80,000 for those with a Ph.D. For all chemists,

Earnings and unemployment rates by educational attainment



Source: Bureau of Labor Statistics Current Population Survey

SOURCE: *Education Pays 2010: The Benefits of Higher Education for Individuals and Society*, by Sandy Baum, Jennifer Ma, and Kathleen Payea, College Board Advocacy & Policy Center. http://trends.collegeboard.org/sites/default/files/education-pays-2010-full-report.pdf, p. 12.

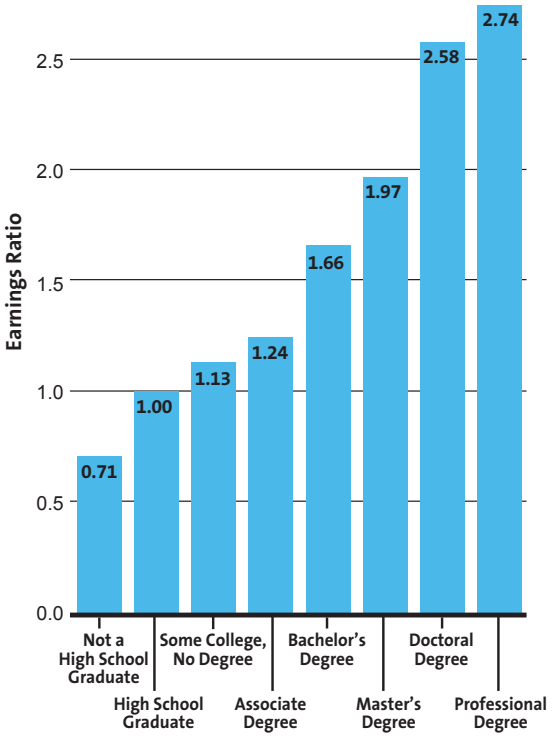
the average salary was $73,900 for a bachelor's and $100,600 for a Ph.D. Data spanning from 1985 to 2012 show that the difference in salary between a Ph.D. chemist and a B.S. chemist grew steadily through 2007, before leveling off in the past five years.

The survey also found that industry and government jobs were more lucrative than positions in academia. In fact, average salaries for chemists with bachelor's degrees working in industry ($76,300) or government ($74,000) were slightly higher than salaries of Ph.D.s working in academia ($73,600). For more information, read the complete article, reprinted on pages 8–10.

David Harwell, assistant director of career management and development at ACS, notes that the return on investment for graduate school is "not as good as it once was, because it takes longer to get established." Salaries for higher degree levels have actually gone down slightly since the financial crisis in 2008, and are just starting to rebound. Jeff Strohl, director of research at the Center on Education and the Workforce, observes that "in more recent years, graduate degree earnings have been the most vibrant." During tough economic times, those with more advanced educations tend to fare the best as more skilled workers come in high demand. The ACS salary survey data indicate that salaries for chemists with bachelor's degrees were hit hardest by the recession. Their unemployment rate also rose to over 6%, while the rate for Ph.D. holders dropped below 4% in the 2012 survey.

Still, according to the ACS survey of new graduates, unprecedented numbers of graduates with advanced degrees now flood the workforce, making top-level jobs in academia and industry more elusive. As an oversupply of Ph.D. chemists compete for a limited number of available jobs requiring graduate degrees, structural unemployment persists and some job seekers are settling for positions for which they are underpaid and overqualified. Plenty of recent graduates spend years as postdoc researchers (41% of Ph.D. grads did so in 2012, with a median starting salary of $40,000) or in non-tenure-track positions at universities where the salary is generally lower. This means a delayed payback of their graduate school investment.

Expected lifetime earnings relative to high school graduates, by education level



NOTE: Based on the sum of median 2008 earnings for full-time year-round workers at each age from 25 to 64 for each education level. No allowance is made for the shorter work life resulting from time spent in college or out of the labor force for other reasons. Future earnings are discounted at a 3% annual rate to account for the reality that, because of forgone interest, dollars received in the future are not worth as much as those received today. This represents real interest, as all earnings are in 2008 dollars. Discounting does not have a large impact on the lifetime earnings ratios.

SOURCES: U.S. Census Bureau, 2009; calculations by the authors.

Get paid to go to school

Fortunately for chemistry students, especially those jockeying for a Ph.D., their tuition costs most likely will be covered entirely by the graduate program they select. Christopher L. Cahill, professor of chemistry at George Washington University in Washington, DC, says: "Undergraduate students typically don't realize that grad school is essentially free." In fact, plenty of doctoral students in the sciences end up getting paid to go to school and do research, thanks in large part to research grants, assistantships, and other forms of funding that are made possible by the U.S. federal government.

In addition, nearly all chemistry Ph.D. students receive monthly stipends that cover tuition and other expenses. It is extremely important, however, to investigate the resources available at each individual school. Stipend amounts tend to vary significantly based on factors like program size and institution type. According to the ACS Committee on Professional Training's Ph.D. Programs in Chemistry Survey Report (2008), the average stipend for graduate students was.

Federal funding is tight these days, thanks to the sequestration and additional proposed cuts to scientific research spending. The BLS recently reported that it expects employment opportunities at for-profit institutions to grow through 2020, while public colleges and universities subject to state and federal government deficits are likely to see layoffs. The money that comes from government agencies and foundations, such as the Department of Energy, the National Institutes of Health, and the National Science Foundation (NSF), goes directly to professors, who must apply annually for grants and fellowships to support their research groups' work. Therefore, the funding that your potential research advisor has access to could determine what will be at your disposal in terms of facilities, equipment, travel, and other expenses.

Should your financial security in graduate school not be certain, bear in mind that a multitude of other funding sources exist. Cahill explains: "At any given time, students in our department are supported by 'all of the above' — stipends and salaries from grants, teaching and research assistantships, fellowships, and scholarships."

Federal graduate student loans

	Direct Stafford	Direct PLUS	Perkins
Annual Limit	Up to $25,000/year	Up to the cost of attendance minus other financial aid	Up to $8,000/year
Eligibility	All are eligible for unsubsidized loan Financial need for subsidized loan; gov't pays interest while in school	Credit history in good standing	Financial need
Rates	Fixed 6.8%	Fixed 7.9%	Fixed 5.0%
Term	Up to 25 years	Up to 25 years	Up to 10 years
First Payment	6 months after graduation	On final disbursement	9 months after graduation

SOURCE: "Borrow from Uncle Sam: Federal Graduate Student Loans," Grad School Heaven, http://www.gradschoolheaven.com/federal-graduate-student-loans.html

Thanks to tuition reimbursement programs offered by employers, many chemists who are employed full-time are also attending college part-time to earn advanced degrees. In these programs, employers provide partial or total reimbursement for employees who complete approved college courses and programs, hoping to breed company loyalty and get more effective workers in the process. Typically, these programs may require employees to maintain a minimum GPA or to have worked at the company for a predetermined amount of time.

If tuition isn't covered by your employer, you can also finance the education through your personal savings or by taking out a loan. A chemistry Ph.D. student taking out loans is a rare occurrence, but those in medical school or certain master's programs are all too familiar with them. Massive increases in tuition costs remain a burden to anyone going through school. Student debt is not to be taken lightly, and unfortunately it may take dozens of years to pay off if not managed properly. For those who will be entering medical school, the statistics are particularly staggering. According to 2011–2012 data from the Association of American Medical Colleges, tuition and fees at public medical schools averaged $29,000 for in-state students and $51,500 for out-of-staters, while private schools averaged $47,000.

Making your decision

While the ROI for graduate school remains positive for chemists, a wide variety of economic and social factors are shrinking those yields. The weight that financial concerns should play in your decision to pursue an advanced degree will also depend on your financial situation and personal values. After considering your own goals and criteria, begin looking into the job market to find potential matches. If your personal, financial, and career goals require that you obtain a graduate degree, perhaps obtaining a higher degree is appropriate if the skills you intend to learn will help you in your future career. Otherwise, if the same skills can be fostered in some other way at a lower opportunity cost, then graduate school can wait. Also, keep in mind that the types of jobs available to those with Ph.D.s are inherently different from those available to less-educated workers. With higher education comes greater responsibility, and Ph.D. students should be prepared to take on leadership and management positions.

Further, earning a Ph.D. is not an instant way to get a better job and a higher salary. Finding a position after graduation will require even more planning, commitment, and hard work. In fact, having a Ph.D. can limit your job options in certain cases. Specialization may make you viable to work in only a select few fields, especially if you lack employment experience. The ACS New Graduates Survey discovered that 58.5% of freshly minted Ph.D.s had less than 12 months of work experience. Take care to choose a graduate advisor with the right connections to either industry or academia, which could make your networking efforts much more fruitful.

Harwell also advocates looking at job markets outside of academia to explore different opportunities. According to a 2011 NSF report, 80% of incoming Ph.D. students claim to be fairly or completely certain that they intend to become tenured professors. This mind-set can be limiting, as work in industry may be more easily attained, and also more profitable. If you know you want to work in industry, it's in your best interest to get real-world experience before graduate school to make yourself more competitive once you enter the job market. Being well-rounded and having a practical, marketable skill set will only enhance your appeal to employers.

Seeing the big picture

While personal and financial concerns will likely impact your decision to go to graduate school, the decision ultimately should depend on your personal situation and career aspirations. Kevin Murphy, an economist at the University of Chicago, once said: "Education gets you a lot more than earnings." Potential earning power shouldn't always be the deciding factor, and perhaps the best reason for going to graduate school is a genuine interest in a certain subject and a deep desire to learn more about it through good old-fashioned research. Cahill believes that one's reasoning should be simple: "Go for the passion of doing science."

Jeffrey Knox *is a rising senior at the College of William and Mary in Williamsburg, VA, studying geology and finance. Jeff is a summer intern in the Publications Division at ACS. He hopes to get a job in the energy industry upon graduation before deciding whether to go to graduate school in geology.*

COLLEGE TO CAREER

Explore Career Options in Materials Science

BY ACS STAFF

Materials science is a relatively new and very broad field. It involves applications from a number of scientific disciplines that contribute to the creation of new materials. Chemists play a predominant role in materials science, because chemistry provides information about the structure and composition of materials, as well as the processes to synthesize and use them.

The central theory behind materials science involves relating the microstructure of a material to its macromolecular physical and chemical properties. By understanding and then changing the microstructure, materials scientists tailor the properties to create custom, or even brand-new, materials with properties designed for specific uses.

Materials scientists are employed by companies that make products from metals, ceramics, and rubber. They also work in the coatings industry, where they develop new varieties of paint, and in the biomedical field, where they design materials that are compatible with human tissues for prosthetics and implants. Other important areas are polymers (including biological polymers), composites (heterogeneous materials made of two or more substances), superconducting materials, graphite materials, integrated-circuit chips, and fuel cells.

Materials science spans so many different disciplines and applications that people who work in this field tend to specialize in a technique or material type. Students are urged to contact associations for ceramic manufacturers, synthetic rubber makers, paints and coatings manufacturers, and plastics makers to find out more about these areas and the opportunities that exist for materials chemists in each.

TECHNICAL SKILLS REQUIRED

- **Fundamental understanding of the structure, composition, and properties of substances**
- **Mathematics and computer science skills, especially the ability to understand and apply statistical techniques**
- **Analytical instrumentation techniques to characterize properties and performance of materials**
- **Critical thinking, problem solving, and analytical skills to determine which tests to conduct and to interpret their results**
- **Communication skills, both written and oral, to share findings with both scientists and non-scientists.**

Where the work happens

Some materials scientists say one of the most satisfying aspects of their work is being involved in a project from the material's initial concept through its manufacture and marketing. Much of their work is performed in the lab, but they also work with engineers and processing specialists in pilot plants or manufacturing facilities. After a material is commercialized, materials scientists often help customers tailor the material to suit their needs. Most materials scientists are employed in industry (including many in the electronics and computer sectors) where products are made, but some are employed by government and academia.

Work description

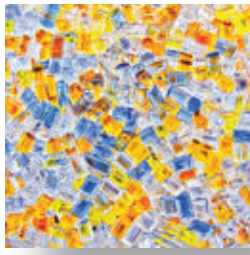
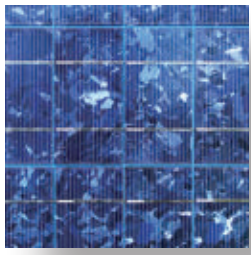
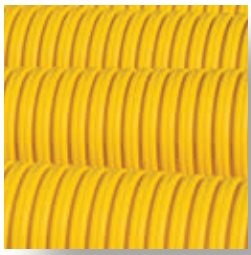
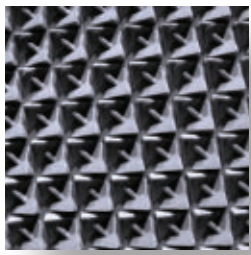
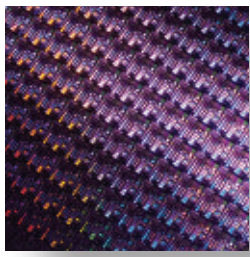
Materials science covers a broad range of sciences; as a result, there is no average day. Materials scientists do everything from fundamental research on the chemical properties of materials to developing new materials and modifying formulations of existing materials to suit new applications. They work with engineers and processing specialists, in pilot plants, and in manufacturing facilities.

Career path

Materials scientists generally gain more independence and responsibility as they progress in their careers. They also tend to become more specialized in a particular type of material — increasing their expertise and value to their company, but sometimes also restricting their job movement possibilities.

Future employment trends

Materials scientists say the current job outlook continues to be positive, because of the ongoing demand for new materials

and modifications of existing materials. Some of them caution, however, that materials science may become a victim of its own success. Since much of the technology developed in the past decade was so advanced, the job growth curve for the future could flatten out. Certain areas within materials science, such as electronics, are already seeing flattening in employment growth.

Is this career a good fit for you?

Most materials scientists describe themselves as curiosity-driven. They say they have always been interested in knowing what things are made of, such as the plastic in the cup they are drinking from or the components of a composite material. They also express a strong interest in engineering and structures. Most describe themselves as generalists; some say they feel their knowledge base is "a mile wide, but an inch deep."

Quick Facts

- **OPPORTUNITIES —** Current job outlook continues to be positive, but the job growth curve for the future could flatten out, as is the case with such areas as electronics.
- **EDUCATION NEEDED —** The materials science field is made up of people with various educational backgrounds. Within materials science, a broad background in various sciences such as chemistry, physics, or engineering is preferred.
- **SALARIES —** Median annual wage: $88,990 (2012), according to the Bureau of Labor Statisics.
- **RELATED FIELDS —** Polymer chemistry is a subset of materials science, and textile chemistry can intersect with materials science.

How to become a materials scientist

The materials science field is made up of people with various educational backgrounds. Most projects in materials science are team efforts that can include technicians, engineers, physicists, and materials scientists with B.S. or M.S. degrees, as well as Ph.D. chemists. Within materials science, a broad background in various sciences such as chemistry, physics, or engineering is preferred.

There are currently about 20 materials science degree programs in the United States, and the number is increasing. Most materials scientists recommend training in a more specific discipline, such as inorganic synthesis and organic chemistry, or a specific materials science, such as ceramic engineering. In addition to their scientific training, materials scientists stress the importance of understanding and being able to apply basic statistical concepts, and many materials scientists advise against specializing too early. iC

Lisa M. Balbes *of Balbes Consultants LLC contributed to this article.*

ACTION ITEMS: What You Can Do Now

Does a career in materials science interest you? Take these steps to learn more!

1. **Research Different Kinds of Materials Science Jobs.** Almost every field of chemistry is applied in a wide variety of positions in manufacturing plants, research laboratories, or pilot plant facilities. Research multiple types of employers, their processes, and the kinds of jobs they offer.
2. **Get Practical Experience.** Ask the career office at your school or alma mater about internships or cooperative programs for chemistry students. Be open to exploring positions in a lab or manufacturing plant; both areas can provide valuable hands-on experience.

   Take classes and attend seminars on topics related to your potential career path. Even if you don't understand everything, you will start to get a sense of what people in that field do, and will become familiar with the terminology.
3. **Conduct Informational Interviews.** Talk with people who have the kind of job you want, to get a first-hand account of what it's really like to work in that field. Find these contacts through ACS, Facebook, LinkedIn, the career office at your school/alma mater, or companies in your area. Ask your interviewee for 15 minutes of their time, and make sure you keep to that limit.

   Ask them about why they went into the field, what they like and don't like about it, and what you need to know before going into the field. You can ask them how to best prepare for a career in the field, what kinds of jobs are available, and what they wish they had known when they were in your position.
4. **Meet with a Chemistry or Chemical Engineering Professor.** Discuss positions in academia, as well as in industry. Find out what education and/or preparation is needed for your potential career and how those needs fit into your educational plans.
5. **Volunteer!** Get involved in your local ACS chapter or other professional organization. Don't just attend meetings — volunteer to help organize career development sessions, outreach activities, and more. You will not only meet professionals in the field and build valuable relationships, but you will also gain organizational and leadership skills that will set you apart from other students once you graduate.

How I Work: Sarah McIntyre

MATERIALS SCIENTIST, SANDIA NATIONAL LABORATORIES

PHOTO: KIM KROPKA, CATCHLIGHT PHOTOGRAPHY

Sarah McIntyre joined Sandia National Laboratories as an undergraduate. A classmate was already an intern at Sandia and suggested McIntyre look into the student internship. When she graduated with a bachelor's degree in chemistry, she was offered a full-time position there as a technician. After four years as a technologist (Sandia lingo for "technician"), McIntyre says, she began her master's program while still working full-time. "A few months prior to completing my M.S., I was promoted to the staff scientist position I currently hold, and I've been in this job for just over a year and a half."

An ACS member since her undergraduate program, today McIntyre takes advantage of the professional development opportunities offered to members, and serves as the PR chair for the Central New Mexico Local Section. "I recently attended the Sparkle Workshop on public relations," she says, "which was a great opportunity, not only as the PR chair, but as a working professional. I learned a lot of great things about how to make chemistry more accessible to non-chemists."

McIntyre is a materials scientist at Sandia National Laboratories. *inChemistry* asked her about her job and what she thinks of it.

Please describe your typical day on the job.

For me, there's really no such thing! I specialize in materials characterization in a group that uses a wide array of materials on a day-to-day basis. When a colleague is using a new material, I may be asked to characterize it. If a colleague is having a problem with an existing material, I might be asked to analyze it in order to determine the origin of the problem. I spend a substantial amount of time (50–75%) analyzing data, and discussing the results with my colleagues via meetings or written reports. My instrumentation is highly automated, so I don't spend as much time in the lab. The time I do spend in the lab typically involves preparing samples for analysis, and then setting up the analysis. I'm also involved in mentoring.

What technology can you not live without?

I can't live without my X-ray photoelectron spectrometer and its associated software!

What is your work environment like?

My office space is in a cubicle located in a "cube farm" area with the rest of my immediate co-workers. Although the cube farm tends to lack on the privacy side, it provides excellent opportunities for collaborative sharing of information when we hear each other chatting with others about various projects, and so on. I also have a laboratory that I share with one other person. We have a few shared spectrometers, with our own workspaces in the lab.

> *"I can't live without my X-ray photoelectron spectrometer and its associated software!"*

What sort of work schedule do you keep?

For the most part, things are pretty relaxed, and I basically work 40–44 hours per week. However, occasionally we'll get hit with a busy week or an extremely high-priority project that requires 50–60 hours in a week to finish.

What is your best productivity trick?

Making lists!! Every morning, I make a list of what I need to accomplish that day — it's easy to track things as I cross them off the list throughout the day, and also lets me visually track my progress and feel good about getting stuff done!

What's the best career advice you've received?

Good things come to those who work hard to improve their skills and patiently seek out new opportunities.

What personal talent or trait makes you a great fit for your job?

Although I truly value all of the technical training and academic work I've completed, I think the personal talent that makes me a great fit for my job is actually my communication skills. As a materials scientist specializing in materials characterization, I see a wide array of materials, and work with many different people on a day-to-day basis. It is important for me to be able to build strong, trust-based relationships with my colleagues, and to be able to communicate the results of my analyses to them in a manner that is clear and easily understood.

What is your favorite ACS resource?

ACS publications. From journals to *C&EN* — I try to stay engaged in the current state of the chemical sciences, and ACS publications are a fantastic resource. iC

Interviewed by **Allison Proffitt**, *a freelance writer and editor based in Nashville, TN.*

Money in Search of Ideas

ACS Undergraduate Program Grants

BY CHRIS ZEIGLER

Here's something you never expect to happen: someone walks up to you and says, "ACS wants to give your chapter money so members can do something incredible. Seriously, just provide a great, well-thought-out idea, and ACS will give you money to make it a reality."

Far-fetched? Not at all! The ACS Undergraduate Programs Office does want to give your chapter money so you can do something incredible.

So what's the catch? To qualify to receive a grant, your chapter must be an active ACS student chapter and complete a grant application by the due date. To be considered "active," a chapter must have at least six paid ACS student members and must have filed a chapter report within the past three years.

The ACS Undergraduate Programs Office has five different types of grants designed to encourage your chapter to do some incredible activities. You and your chapter are invited to apply for any (or all) of the grants described below!

PHOTO COURTESY OF FRANCIS MARION UNIVERSITY

During National Chemistry Week, the Francis Marion University (Florence, SC) student chapter provided giveaways of Nan-O-Moles, water bottles, and chemistry bumper stickers as well as the ACS pamphlets for National Chemistry Week. ACS provides Innovative Activities Grants to help fund these types of new and innovative activities.

Teach chemistry to kids who really need it

You know that school near your institution that has next to no money for science enrichment because budgets are stretched to the max? We'd like to encourage you to share your love of chemistry there. Apply for our Community Interaction Grant with a great idea to share chemistry at that school, or any other school serving underrepresented racial or economic minorities, and you may be eligible for up to $500 in funding! (Deadline: March 2014.)

Do something you've never done before

Do you have an idea that's good, but untried? If you can find another organization that is willing to provide matching funds, then submit your idea with your application to our Innovative Activities Grant program. ACS will match up to $500 that you have received from other sources to help transform your idea into a reality. (Deadline: March 2014)

Host other ACS student chapters or high school chemistry clubs

Do you ever wonder what research other universities are doing? Or does your chapter want to compete at an event like the Battle of the Chem Clubs (see pages 24–25)? Have you ever reached out to any high school chemistry clubs in your area? Apply for an ACS Student Inter-Chapter Relations Grant to fund activities such as research symposia, competitions, and other collaborative activities with fellow chapters in your area. The grant is worth up to $500, but if you include your local section in the activity, it can be worth up to $750! (Deadline: October 1, 2013.)

Travel to a national meeting

Are you presenting a poster at the 247th ACS National Meeting in Dallas? What about someone from your chapter? If at least one person from your chapter is presenting a poster, your student chapter is eligible to receive $300 in travel funds, thanks to the National Meeting Travel Grant. (Deadline: December 5, 2013; we also offer grants for the spring national meetings.)

Host programming at a regional meeting

There are five to eight ACS regional meetings every year, held in different geographical regions of the United States. Each meeting has its own unique flavor, reflecting the diverse professional interests of each region. The ACS Undergraduate Programs Office funds industrious chapters in their efforts to host programming for undergraduates at a regional meeting. If your chapter is interested, apply for our Undergraduate Programming at Regional Meetings Grant. Develop some programming ideas, and we may fund up to $2,800 to conduct the program. By the way, if you're not sure where the next regional meeting will be, visit www.acs.org/meetings. (Deadlines: September 27, 2013, for 2014 spring regional meetings; November 1, 2013, for 2014 fall regional meetings.)

Want to know more? Go to www.acs.org/undergrad and click on Student Chapters to learn more, or contact me at c_zeigler@acs.org. We look forward to funding your ideas! iC

Chris Zeigler *is an education associate in the ACS Undergraduate Programs Office.*

Battle of the Chem Clubs

The Benefits of Developing Inter-Chapter Relations

BY ROBERT HEATON

ACS has developed the new Student Inter-Chapter Relations Grant program for student chapters, which provides $500 to support activities involving two or more chapters — and $750 for collaborations that also involve an ACS local section. The grant can be used to fund a wide variety of activities, including:

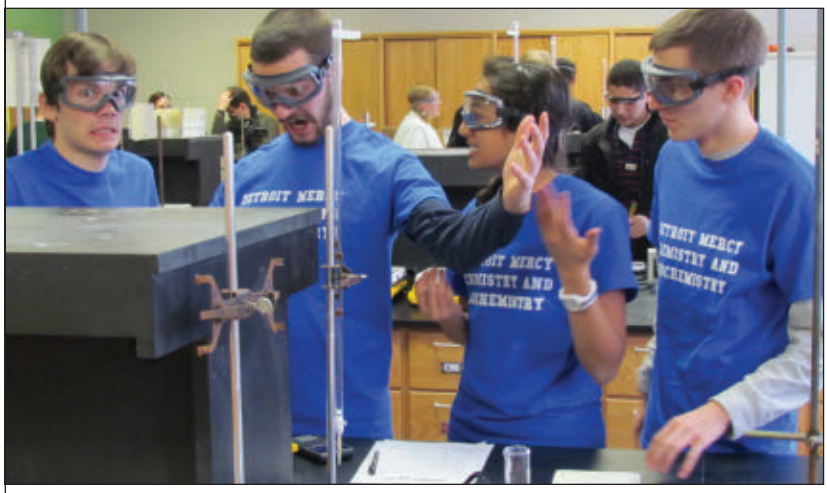
- **Networking events with graduate students or others further along in their careers**
- **Chemistry outreach demonstrations to the public**
- **National Chemistry Week, Chemists Celebrate Earth Day, and National Lab Day events**
- **Local science or community fairs**
- **Inter-chapter competitions with a chemistry theme.**

The new grant was developed because partnering with other ACS student chapters offers major benefits. This type of collaboration often spurs new ideas for programs and events, a larger pool of potential volunteers, and a wider perspective that comes from increased involvement with more ACS student members. Not only are these partnerships invigorating, they also allow chapters to participate in projects that they might not have the resources to do on their own.

An example of one of the most successful ACS inter-chapter partnerships is the Battle of the Chemistry Clubs, an event that first took place on a cold November day in 2007. Initiated by students and faculty from the University of Detroit Mercy and the University of Michigan-Flint (UMF), the competition has since grown to include 12 ACS student chapters from across Michigan and Ohio, and the Michigan State University Younger Chemists Committee is now responsible for organizing and planning the event.

An evolving annual event

What began as an undergraduate social event to promote inter-club relations and spur a friendly competition for the coveted Silver Sep Funnel trophy has since evolved into an invaluable networking opportunity between undergraduate and graduate students. “Our chapter looks forward to this event every year,” explains Robert Heaton, a UMF team member. During this much-anticipated annual event, chapters take pride in showing off their school spirit and embrace the geek factor of the event by donning chemistry-themed team T-shirts. Heaton adds, “Battle of the Chem Clubs strengthens the relationships and team spirit between our own chapter members, and also helps us connect with other student chapters.”



The University of Detroit Mercy team reacts under the strain of the competition in Lansing, MI.

The University of Detroit Mercy team works on one of the challenges outside the lab.

PHOTOS COURTESY OF UNIVERSITY OF DETROIT MERCY

For the first few years, the location of the event rotated among the participating schools, but it has since settled at Michigan State University, a central location for the many schools that participate. The timing of the event has also changed, moving to late January so that it doesn't interfere with final exams or attending the spring ACS national meeting.

The chemistry knowledge tested in the various competitions has also evolved; it now focuses on general and organic chemistry to give teams more flexibility when recruiting students for their teams. Schools have entered the competition with teams consisting of as few as four members, and as many as 20!

Meeting the challenges

Events have become more fun and complex with each passing year, but always include a combination of physical and mental challenges. The first Battle of the Chem Clubs included titration races, dry ice curling, a calculation relay, and a Quiz Bowl-style final round. Since then, events have included a spectroscopy challenge, periodic table darts, and lab bench challenges — including "Build Your Own Battery," "Find the Absorbance of an Unknown," and "Size Matters." Size Matters included a calculation relay followed by a competition to generate the largest black carbon snake using sugar and sulfuric acid.

Recent competitions have also incorporated lab safety components into the challenges in fun and quirky ways, sometimes requiring participants to don full safety gear to attempt physical challenges. Alexa Barres explains, "Last year, competitors had to wear at least five personal protective equipment (PPE) pieces, run through an obstacle course, and carefully grab and carry back a safety-hazard-marked bottle using only tongs. Then, the member who had just finished had to help the next team member put on all the PPE as quickly as possible and repeat the challenge."

Every year, Battle of the Chem Clubs begins with a series of morning chemistry challenges covering a range of chemistry topics. Lunch and social time follow, and scores from the morning's challenges are tallied to rank teams. Quarter- and semi-finals follow in the afternoon, with relay competitions and time-dependent challenges. In the final round, surviving teams participate in the Chemistry Jeopardy challenge. Some of the question categories from recent battles have been, "I told a chemistry joke," "But there was no reaction," "It is elemental, my dear Watson," and "IUPAC rat."

The winning team is awarded serious bragging rights, and the Silver Sep Funnel. In addition, a new trophy has been added: the team with the loudest, most obnoxious cheering is now awarded Most Obnoxious Grenade.

Students who participate in the Battle of the Chem Clubs benefit in a variety of ways. The competition not only builds camaraderie among student chapters but also increases students' knowledge of chemistry, and promotes the study of chemistry in a fun way. Barres explains, "It is challenging, yet exciting, to put what I have learned to the test while under the pressure of competition." Heaton adds, "Battle of the Chem Clubs is a unique event where my love for chemistry and my competitive nature can combine."

To learn more about the new Student Inter-Chapter Relations Grant, go to **www.acs.org/undergrad** and click on Student Chapters. The deadline for applying for a Student Inter-Chapter Relations Grant is October 1. iC

Robert Heaton *is a senior at the University of Michigan-Flint, where he serves as the vice president of the ACS student chapter. He is majoring in biochemistry and Spanish, and is currently researching the effects of vitamin D on cancer cell death and drug treatment synergy.*

PHOTO COURTESY OF FERRIS STATE UNIVERSITY

The Ferris State University team performs analyses as quickly, yet as accurately, as they can.

PHOTO COURTESY OF WAYNE STATE UNIVERSITY

The Wayne State University team plays chemical hangman.

SPOTLIGHT
Denison University
Granville, OH

DENISON UNIVERSITY

COMPILED BY ROBIN LINDSEY

Chapter president: Annelise Thompson **Number of chapter members:** 30 **Number of ACS student members:** 6
Institution description: Small, private, rural, 4-year

Q: Do you have any unique positions?

A: Two juniors serve as Juniors-at-Large. Having this position ensures that the juniors are part of the chapter governance and that their voice is heard, especially as the officers make budget decisions in late February and early March before the new officers are elected for the next year. Over the past few years, we have found that our governing body in the Denison Chemical Society (DCS) has been composed mostly of senior chemistry and biochemistry students. While this is typically not a problem throughout the year, near the end of the year as the seniors are finishing up their senior theses and heading toward graduation, transitioning responsibilities to the junior class can be difficult.

Q: Do you collaborate with other clubs on campus on activities?

A: We have collaborated with other campus organizations to hold science exploration days on campus for area kids. This year for Make a Difference Day, we are collaborating with the Service Learning Center to put on a program that brings Girl and Boy Scouts to campus to get them excited about going to college someday. DCS will be doing chemistry demonstrations to get the kids who participate excited about science, especially chemistry!

Q: What is your most successful fundraiser to date?

A: Our most successful fundraiser is the annual Mole-a-thon, which takes place around October 23 every year. Each Denison participant pays $5 ($10 for non-Denison students) to run 6.02 km in celebration of Mole Day and to promote an active lifestyle, with all proceeds going toward the ACS Scholars Fund. On average, we have 30–40 participants, with interest growing every year. Chemistry-related prizes are also awarded for top-place finishers.

Q: Has your chapter recently had any fun social events?

A: One of our big events at the beginning of the year is called Chem Bash, a big dinner catered for the entire department by one of the local restaurants. This event is meant to help faculty and students build relationships outside of the classroom while they enjoy delicious food. Leftovers at this event are very rare!

Q: Have any members of your chapter attended recent ACS regional, national, or local section meetings?

A: Eight of our members who perform research at Denison attended the 2012 ACS spring national meeting and presented posters at the undergraduate poster session. This was an incredible experience! It was amazing to see and meet so many other undergraduate presenters from all over the country. It was also very helpful to talk to graduate students about their work and experiences, as well as to attend talks by professors on such a wide range of topics! Everyone who went agreed that the ACS meeting was simply inspiring.

PHOTO COURTESY OF DENISON UNIVERSITY

Each year around October 23, DCS chapter members participate in and organize an annual Mole-a-thon, and all proceeds are donated to the ACS Scholars Fund.

Q: Describe a special project the chapter recently did or is now doing.

A: We are currently working with a local science museum — The Works, in Newark, OH — to put on a chemistry show as part of their STEM programming, "Science Sunday." We will have a full hour to do our presentation, and our chapter is working on the demonstrations and curriculum for this event!

Faculty advisor:
Joseph Reczek, 4 years

Q: How did you become a faculty advisor?

Reczek: I asked my department for the opportunity. I believe in helping to encourage and empower students toward having a positive impact on the community, and in sharing my passion for chemistry as a force for good (and fun!) in our society.

Q: What has been the most rewarding aspect of your service as a faculty advisor?

Reczek: By far the most rewarding aspect has been watching students respond to our increased outreach efforts. Our enrollment has increased as word of our outreach activities has spread, and we regularly get over a dozen volunteers for our events working with local kids. It is extremely rewarding to watch DCS students getting engaged in these ways.

Q: What advice can you offer those new to the advisor position?

Reczek: Challenge your students to find ways to engage with their college and local community. There are many low-cost options for interacting with primary school students, and the impact can be truly substantial for all involved!

SPOTLIGHT

University of Texas at Dallas Richardson, TX

COMPILED BY ROBIN LINDSEY

Chapter president: Michael Kraft **Number of chapter members:** 77 **Number of ACS student members:** 12
Website: www.facebook.com/csaatutd **Institution description:** Large, public, suburban, 4-year

Q: How did you celebrate National Chemistry Week (NCW)?

A: For NCW, we ran a wide variety of events. This year we chalked sidewalks, painted the university's large "Spirit Rocks," and helped run an event at a local science museum. We also held a bake sale where we gave away pom-pom moles (for Mole Day!), held a general meeting with a speaker on nanotechnology, and had a BBQ social.

Q: What is your most successful recruiting event/method?

A: During the summer, when the university has its freshman orientation sessions, we set up a booth and drum up interest for our chapter by performing demos and handing out informative leaflets.

Q: What are your most popular or unique chapter activities?

A: We invite chemists to give career-centered presentations. We also invite professors to play the ice sport "broomball" with our members. Broomball is an annual event that occurs before students have their finals and is a fun way for students to bond with professors.

Q: Do you collaborate on activities with other clubs on campus?

A: We often collaborate with other service organizations such as Alpha Phi Omega (APO) and other fraternities during Scholars' Day, which is the university's open house for prospective students. We help run APO's annual Math and Science Camp, where we teach four classes of elementary and middle school students. The classes usually consist of a short chemistry lesson followed by a demonstration. Also, as part of a simple lesson on polymer cross-linkers, we let the students make their own slime to take home.

Q: What local ACS student chapters have you collaborated with?

A: Our most recent collaboration with other ACS chapters occurred during NCW. We worked with other universities to host an event for children and teens at the Fort Worth Science Museum. The event's theme was nanotechnology; we held demonstrations and created hands-on activities for kids that showcased the importance of nanotechnology in the real world.

Q: What is your most successful fundraiser to date?

A: Each year we sell lab supplies to students to raise money. Our most successful sale was this year, when we sold over 900 pairs of safety goggles! We also experimented with selling combination locks and composition notebooks (both required for labs) for the first time; our trial inventory quickly sold out, and we intend to carry full inventories of both items next semester.

Q: Describe a challenge your chapter recently overcame and how members overcame it.

A: While running our fall fundraiser, there was a shortage of safety glasses to sell while we waited for more to arrive in the mail. To keep up with demand, we decided to drive to local stores and buy all the safety glasses we could find. Although our profit margins were slim on these purchases, the extra effort allowed us to keep making sales and providing students with vital lab supplies.

PHOTO COURTESY OF UNIVERSITY OF TEXAS AT DALLAS

UTD chapter members pose with their Outstanding Student Chapter award at the 245th ACS National Meeting in New Orleans, LA.

Q: What careers-related events does your chapter do?

A: We often invite industry experts to speak to our membership. Last year we had general meetings with a representative from the university's Career Center and the Society of Cosmetic Chemists. We also held a "Get a Job" meeting, where representatives from Kaplan Test Prep, a local tutoring service, and an on-campus tutor employer talked about the employment opportunities their companies offered. This semester we held a general meeting with the chief scientific officer of Mary Kay.

Q: Is there anything else you want the readers of *inChemistry* to know about your chapter?

A: We are always excited to take on new projects; please contact us if you're interested in working with our organization! iC

Faculty advisor:
Kenneth J. Balkus, Jr., 1 year

Q: Why/how did you become a faculty advisor?

Balkus: I have been working with undergraduates for 25 years, including a few years as undergraduate advisor. When the position became available, I volunteered.

Q: What has been the most rewarding aspect of your service as a faculty advisor?

Balkus: The chapter's success is my reward. It was fun to see the students accept their Outstanding Chapter award at the 245th ACS National Meeting in New Orleans. iC

South Dakota State University

Graduate Studies

Chemistry & Biochemistry

Department of Chemistry and Biochemistry

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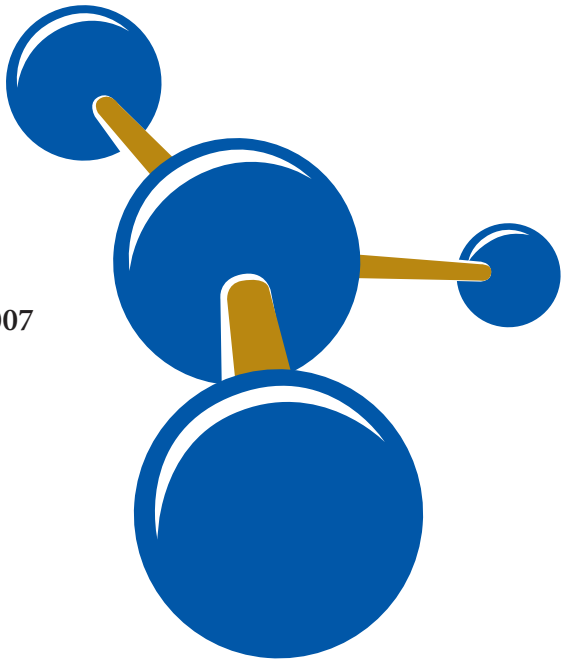
Brookings, SD 57007
(605) 688-5151



The Department

A medium-sized, friendly department with 16 faculty and 65 graduate students. New research and instructional laboratory facilities.Well-equipped core instrumentation facilities.

Degrees

Ph.D. and M.S. degrees in chemistry. Research specializations in Analytical/ Environmental, Biochemistry, Organic, Biophysical Chemistry, Biophotonics, and Chemical Education.

Financial Aid

All students admitted receive a full stipend and tuition remission.

Admission Requirements

Applicants should be nearing completion of a degree in chemistry, biochemistry, or related fields and have a B average or better.

For More Information

Phone: (605) 688-5151

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Web: www.chembiochem.sdstate.edu or scan the QR code to visit our site.

ACS Chemistry for Life®

American Chemical Society
1155 Sixteenth Street, NW
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STUDENT SKILLS FOR SUCCESS:

A Networking Session for Faculty, Students, and Employers

44th ACS Western Regional Meeting (WRM)

Santa Clara, CA • Hyatt Regency

Friday, October 4, 2013
3:30 – 5:30 p.m. PDT

- Be part of a network of students, recent graduates, two- and four-year faculty, and employers
- Learn about professional skills needed for success in academic and professional careers.
- Bring business cards and participate in the networking session preceding the event!

This free event is open to 44th WRM registrants. The deadline to register for the event is by ***Friday, September 20, 2013***. For more information and registration, visit www.acs.org/2YColleges.

Students are eligible for free business cards. Participation is limited, so sign up as soon as possible.