The Magazine for ACS Student Affiliates
February/March 2008

in Chemistry

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MILLIKIN UNIVERSITY


SUFFOLK UNIVERSITY


TARLETON STATE UNIVERSITY


PHILADELPHIA DEPARTMENT OF TOURIS

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COURTESY OF MARY K. CARROLL

Reporting on Reports

By Mary K. Carroll

Your SAACS chapter did something great, why not get some credit? Maybe it was something your chapter had never done before, such as an original fundraiser, a new National Chemistry Week activity, or a wildly successful campus social event. Perhaps it was a continuation of a successful program, such as science outreach to local schools, or participation in research symposia on- or off-campus. Or maybe this was a year in which your chapter contributed significantly to an initiative of your department or your local ACS section.

ACS would like to know about and reward these and other activities.Just submit your SAACS chapter's annual report by the June 4, 2008, deadline and indicate that your chapter would like to be considered for an award.

Even though nearly all SAACS chapters hold activities in a given year, not all submit annual reports. Of those that do, many don't request to be considered for awards. Why not? I'll detail two of the most common reasons.

First, let's face it: it's far more enjoyable to organize, host, and participate in the outreach events of your chapter than to write up the annual report on chapter activities. But the process of filling out a detailed report forces you to consider carefully your chapter's successes as well as any areas in which your chapter may have fallen short of its goals. Thus, preparing the report is a valuable exercise for your chapter's student leaders.

Second, 'senioritis' can be a major culprit. Chapter officers are often preparing to go on to additional study elsewhere, or take a position in the 'real world.' Their focus is on the future, not the past. But it is vitally important to the health of the chapter to transfer the experience of this year's chapter officers to the new leaders. Having both years' leaders work together to prepare the chapter report is an outstanding way to do this. And as they say, 'many hands make light work.'

How does the review process work? (what happens next?)

After a chapter requests award consideration, its report is sent to on-line reviewers, each of whom is a faculty advisor to another SAACS chapter. Then, participants in a summertime Peer-Review Conference (also faculty advisors) look at the comments from the on-line reviewers, as well as the chapter reports themselves, and make the final decision as to whether each chapter will receive an award and, if so, at which level. Every chapter that is considered for the award receives reviewers' detailed comments on its report. Award letters are mailed to the chapter advisor and the president of each award-winning college or university. A list of the Outstanding, Commendable, and Honorable Mention SAACS Chapter Awards is published in in Chemistry magazine, in C&EN and on the ACS website. All award-winning chapters are recognized at a special award ceremony at the ACS National Meeting in the spring of the following year.

Of course, some of the chapters that ask to be considered for awards do not receive awards. So why go to the trouble of submitting a report if you don't think it was your chapter's best year?

1. Preparing the report is both a useful exercise in self-reflection and an opportunity to ensure continuity of effort from one year's officers to the next.

2. It is possible that you are being overly self-critical. Once you sit down to detail your efforts over the year, you may discover that your accomplishments were significant. And the reviewers may agree!

3. The most important reason is that you will receive valuable comments from the reviewers: praise for your best efforts, encouragement for new initiatives, and suggestions for improvements in other areas.

Want some more insights?

First, send your questions to saprogram@acs.org. Second, encourage your SAACS chapter advisor to volunteer as a reviewer. The process of reviewing other chapters' reports will help your advisor to put your chapter's accomplishments into perspective. And your advisor will learn of interesting and novel activities undertaken by other chapters that might be adapted for use at your institution and pick up some tips on how your chapter could better present its activities in future reports.

Your SAACS chapter did accomplish something great this year … so please tell the ACS all about it in your chapter report. On behalf of the Society Committee on Education, thank you for your chapter's contributions to your campus and the broader community. Keep up the good work! iC

Mary K. Carroll

Mary K. Carroll is professor of chemistry and director of undergraduate research for Union College in Schenectady, NY, where she has served as SAACS chapter advisor since 1994. She is also councilor for the Eastern New York ACS Section, a member of the Society Committee on Education, and moderator of the SAACS Chapter Report Peer-Review Conference.

Share what's going on in your chapter! If your chapter would like to be featured in the Chapter Spotlight, please contact saprogram@acs.org or 800-227-5558, ext. 4480.

Millikin University
Decatur, IL

Chapter president: Andy Dunn
Number of chapter members: 28
Number of ACS Student Affiliates: 12
School environment/ composition: Small, private, urban, 4-year institution
website: http://students.millikin.edu/~acs

MILLIKIN UNIVERSITY

Q How do you retain members from year to year?
A We try to have our members decide what we do as a chapter, because we feel that they will be more likely to stay involved and remain a part of the chapter.

Q What is your most successful chapter activity?
A Our annual alumni lecture at Homecoming in October. We started the series in 2003 to honor graduates who have made significant contributions to chemistry in their careers. Because of the success of the fall lecture series, we have recently started a Graduate of the Last Decade (GOLD) lecture series. In the spring, we invite back an alum who has graduated within the last decade to come and share his or her experiences with us so that we can get an idea of how young Millikin chemists are making an impact after they graduate.

Q How do you encourage regular attendance at chapter meetings?
A Besides providing food and refreshments, our chapter encourages regular attendance by promoting the involvement of our members. We have created four committees within our organization that are each chaired by one of the four officers. We have fundraising, events, chemistry in the community, and children's chemistry book committees. Members of these committees are responsible for attending meetings regularly to stay informed about what their group is doing and volunteer to help.

Q What is your most successful fundraiser to date?
A Our "ACS snack fridge." In the Leighty-Tabor Science Center. The vending and pop machines are located in the basement, which isn't convenient for the chemistry faculty or students in classes that are located on the fourth floor. Our organization bought a mini refrigerator that we put in the fourth-floor suite and keep stocked with candy, chips, granola bars, fruit, soda, and water. We charge $0.50 for each item and average about $20 a week. This year-long fundraiser is easy to manage, raises enough money to keep the fridge stocked, and the profits help pay for our events.

Q From what sources does your chapter receive its operating funds?
A As an active student organization, we apply for an allocation of funds each semester through the Office of Student Programs. In addition, we raise money through member dues, sales from our snack fridge, and sales of lab notebooks and safety glasses. We ask for and receive sponsorship of one event per year by the local section of the ACS. For travel to national meetings, we apply for National Meeting Travel Grants when we qualify, and the chemistry department usually pays the expenses of one student.

Faculty Advisor
George Bennett, 8 years

Q Why/how did you become a faculty advisor?
A My predecessor had been faculty advisor for a number of years. She thought the chapter was starting to stagnate and that a change in advisor might generate some new momentum, so she asked me if I was interested in assuming the role. I had already been attending chapter meetings and had been here long enough to have had most of the chapter members in class, so the transition wasn't too difficult.

Q What is your role as a faculty advisor?
A First and foremost, I make sure the chapter remains in good standing with both the university and the ACS, so I need to know policies that pertain to different kinds of events, deadlines for paperwork, and things of that nature. By university rule, I have to give final approval to the chapter's financial transactions, and I am expected to attend chapter events. Beyond that, I try to ensure that the chapter celebrates National Chemistry Week and has at least three green chemistry events, and I help with some of the logistics of planning events throughout the year. I manage the chapter Web page, too. With respect to the officers, I try to help them learn how to run meetings effectively and get more chapter members involved.

Q What challenges have you faced in your position?
A My biggest ongoing challenge is knowing how active a role to play. Ultimately, the chapter is a student organization, so the students should run the show. I do not want my intervention to turn into domination. Other challenges include trying to maintain continuity from year to year when the officers change annually, and dealing with personal conflicts between officers.

Q What has been the most rewarding aspect of your service as a faculty advisor?
A Accompanying students to the spring national ACS meeting is always enjoyable for me. When our chapter is fortunate enough to win a chapter award, I find it rewarding to inform the officers from the previous year that their work was noticed and appreciated. I also like when a chapter event becomes a tradition. That usually means the members have taken ownership of it.

Q What advice can you offer those new to the advisor position?
A Keep reminding your officers that they don't necessarily need to do everything the same way every time.

North Dakota State University
Fargo, ND

Faculty Advisor: Seth C. Rasmussen
Chapter president: Danielle Vaughn
Number of chapter members: 50
Number of ACS Student Affiliates: 11
Institution environment/ composition: Large, public, urban, 4-year institution

Q Does your chapter collaborate with other campus organizations? If so, how?

A Our chapter has most frequently collaborated with other science and math organizations, such as the math club, to facilitate math and science-based events. We also work with the GraSUS program of the Center for Science and Mathematics Education, which puts us in touch with local schools needing our assistance in providing tutoring and demonstrations in chemistry or related subjects. Most recently, we worked with Campus Attractions, the student programming board, to provide chemistry demonstrations for fellow students as part of "MU Live," a monthly campus event that provides students with Friday night entertainment.

Q Does your chapter attend ACS national/regional meetings? How many times/year?

A Our chapter attends the ACS national meeting each spring. In addition, members attend the Great Lakes Regional ACS meeting in years when it is held within a reasonable driving distance.

Q Has your chapter presented research findings and/or chapter activities at a poster session?

A Members of our chapter regularly present posters as part of sessions at national, regional, and local meetings. Since many members actively participate in interesting and novel undergraduate research, they can take advantage of the opportunity to present their research as part of the chapter's yearly trip to the ACS national meeting, where we also present information about our chapter activities. Chapter members look forward to these events as wonderful opportunities to discuss and learn new aspects of chemistry, as well as network with other students, professors, and members of industry.


NORTH DAKOTA STATE UNIVERSITY

Q What methods of communication are used to inform chapter members of chapter activities?

A In addition to our monthly meetings, we use many forms of Internet communication, including a Blackboard site (the networking tool used by professors at the school), a chapter e-mail listserve, and a Facebook group (a popular social networking tool). The chapter also maintains the chemistry department's Broberg Memorial Undergraduate Lounge, where a bulletin board, dry-erase board, and calendar of events are used to keep members up-to-date on events and activities.

Q How many fundraisers does your chapter sponsor per school year?

A Our chapter holds four primary fundraising activities each year.

Q What is your most successful fundraiser to date?

A Our most lucrative fundraising venture each year is concession sales at the FargoDome, our city's main concert and sports venue. Members operate a concession booth during football games, concerts, and other events, for which the chapter receives a percentage of the profit. This has proven a useful tool for fundraising, as well as a great bonding opportunity for the members.

Faculty Advisor
Seth C. Rasmussen
7 years

Q Why/how did you become a faculty advisor?

A I have always been very active with the undergraduate majors and I became a faculty advisor to ensure that the students had someone to turn to when they needed advice or additional leadership.

Q What is your role as a faculty advisor?

A My primary role is as a supervisor: reminding officers of deadlines or chapter obligations, pointing out opportunities and/or pitfalls in relation to chapter activities, and resolving chapter conflicts. I also act as a bridge between the students and the faculty or administration.

Q What challenges have you faced in your position?

A The greatest challenge is always dealing with the fallout of someone not following through with an obligation or responsibility. Every once in a while there are also personal conflicts within the chapter that limit productivity and must be resolved.

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

A Getting to know the students on a much more personal level than is possible in a typical classroom setting, and thus having a much bigger impact on their scientific and professional growth.

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

A My best advice is to make sure to cultivate some of the younger students as potential future chapter officers. The health of the chapter is very much dependent on good officers, and thus it is in the chapter's best interest to be proactive in steering promising students toward chapter leadership. ic

QUESTIONS ABOUT THE STUDENT AFFILIATES PROGRAM?

Call 1-800-227-5558 and ask to be connected to:

- **Robin Y. Lindsey** (x4480) or Nancy Bakowski (x6166) for general information and chapter activation
- **Audley Burke** (x4565) for information on chapter grants, retention, and recruitment
- **Lori Betsock** (x6188) for information on internships, study abroad, careers, and graduate school

LOOKING FOR CHAPTER ACTIVITY IDEAS?

By Robin Y. Lindsey

ACS Student Affiliates chapters across the U.S. and Puerto Rico are engaged in exciting, innovative, and educational activities. To give chapters few ideas for expanding their activities, we highlight chapters and their work as reported in the chapter reports. Submit your report with a good description of your activities, and your chapter's activity just might appear in a future issue of in Chemistry. If you have any questions about any of the activities listed below or would like further information on how to implement them, please contact the SAACS chapter directly. Good luck!

Coe College, Cedar Rapids, IA

SAACS members at Coe College planned a Playground of Science event. This annual event at the college is a night where 4th and 5th graders and their families come to Peterson Hall, our science building, to learn more about chemistry, biology, physics, and math through experiments and activities presented by the respective science clubs.

How long did it take to plan the activity and what was involved?

Playground of Science has been an event at Coe College for five years, so planning was really easy. We have always showcased our "classic experiments," such as fake snow, the glowing pickle, and goo. We had a general meeting to go over new experiments and the layout of the chemistry floor's activities. We also met the day of the event to explain to the new club members how the experiments work and how to involve the young students.

What planning resources did you use?

Planning began with an initial meeting with the entire chemistry club and then a couple of meetings with the executive board for more concrete planning. The chemistry, biology, math, and physics clubs sent out invitations to all the elementary schools in the Linn County, IA and some surrounding counties.

COE COLLEGE

How many Student Affiliates participated?

Our club is relatively small. We had eight Student Affiliates and 20 others participating and helping on the chemistry floor.

How many people attended the event?

Event attendees included 1,800 parents and children — a record audience — who rotated through the display at their leisure. Four individual clubs presented laboratory experiences on three different floors, each showcasing from one to four experiments for the audience. For example, we had a "glow room" which housed the glowing pickle, luminal, and glowing goo experiments. It was nearly impossible for a family to see and do every activity.

What was the age range of the audience?

We had students from fourth and fifth grade. We also had a range of ages, including the students' older family members.

How long did it last?

The event lasted from 6:00 to 9:00 pm on a Thursday night. As we have done before, we held the event during the week of Halloween.

What safety equipment was required?

To make sure everything was kid- and crowd-friendly, all the materials we used were non-toxic. We did use dry ice for the universal indicator demonstrations, and our demonstrator explained to the audience how cold the dry ice was and how the extremes of pH meant the solution could be dangerous. The student demonstrator wore gloves and goggles for this demonstration.

Our advice to other chapters is to get out into the community. It is so important to be role models to young scientists and to give them a thirst for knowledge.

For additional information, please contact Martin St. Clair, faculty advisor, at **mstclair@coe.edu.**

Pacific Lutheran University, Tacoma, WA

The SAACS Chapter at Pacific Lutheran University planned a Desserts and Demos event for local public school students.

We held the event on a weeknight (other than Friday), and it lasted for about 1.5 to 2 hours. At 7:00 p.m., we began with dessert — by making liquid nitrogen ice cream in the lobby of our Science Center. We also had dry ice punch and cookies, and occasionally, baked goods as well. After about a half hour of social time and introducing the school classes and their teachers, we moved to our Open Laboratory for hands-on demonstrations, conducted

first by our guests and then by faculty.

Hands-on demos for our guests included DNA extraction from bananas or other sources, investigations with "Magic Sand," synthesis of nylon, making Gak and Ooblek, investigations with density using colored liquids, chromatography with water-soluble inks, UV-active beads, invisible ink, etc. Stations were set up around the Open Laboratory with signs, and supervised by Student Affiliates members and roving faculty. Our guests were divided into groups and distributed around the stations in the lab.


PACIFIC LUTHERAN UNIVERSITY

After about 45-60 minutes of hands-on activities, the crowd gathered around an area of the Open Laboratory where the faculty did demonstrations. Favorite faculty demonstrations included the "Tinkerbell Demo," "Elephant Toothpaste," a clock reaction, the "Screaming Gummy Bear," the "Carbon Snake," "Burning Money", etc. We purchased many of the supplies needed for the hands-on activities with funds from an ACS Innovative Activities Grant awarded to the Puget Sound Local Section, from which our club successfully competed for a share.

How long did it take to plan the activity and what was involved?

Since this is an annual event, the concept for the event had already been created. The majority of the planning required this year was determining how to best spend the grant money we had received from the local ACS section. We had to choose demos for the small-group, hands-on portion that would provide the best introduction to the world of chemistry for student audiences. We also had to choose demos that the faculty could perform for the large group. Next, we assigned Chemistry Club students to prepare reagents and materials for as many specific demos as possible. The day of the event involved preparing our unique open lab space and the downstairs lobby for the desserts portion.

What planning resources did you use?

We used our experience from previous years in planning this event, and "tapped the brains" of our faculty to come up with fun demo ideas. Our experience from previous years helped us fine-tune the logistical side of the evening as well. Additionally, the Internet was an invaluable resource in finding demo ideas. Also, one can never underestimate the benefit of laboratory textbooks; we used the 'nylon lab' from our organic textbook for one of the more advanced demos.

How many SAs participated?

There were a handful of key students involved in the majority of the planning and prep work, but when it came to the actual event, approximately 15 Chemistry Club participants were vital to our success. The majority of help was needed in leading the different hands-on stations we had set up. We also had the assistance and support of every chemistry faculty member for this event, plus a few biology faculty to help with the DNA extraction demo.

How many people attended the event?

70 students attended, plus their teachers.

What was the age range of the audience?

One fourth-grade class and several high school classes attended. We have also had middle school students attend in previous years.

How long did it last?

The dessert social portion (including the making of ice cream using liquid nitrogen) took the first half hour. We then proceeded upstairs for 45 minutes of hands-on demos. The final 20 minutes was for faculty demos, which concluded the event with a bang, so to speak.

What safety equipment or preparation was required?

First, we decided to hold the desserts portion downstairs in the lobby, away from the lab space, specifically to discourage our guests from bringing food into the lab space. Appropriate safety gear was worn by those handling the liquid nitrogen and making ice cream. For the hands-on portion, we created a "goggles-on" zone in which we stationed all the demos requiring goggles. This zone was clearly marked, and strongly enforced to ensure the safety of everyone. For the faculty demo section, we kept people about five feet away from the fume hood area where the demos were taking place. The safety of our guests and fellow Chemistry Club students was our utmost priority, with their entertainment and education a close second!

What advice would you give other chapters regarding this activity?

We used to offer an event with only faculty demonstrations. That was fun, but static. Adding the flair of liquid nitrogen ice cream, dry ice punch, and other desserts boosted the social aspect of the event. Having the hands-on activities at well-organized stations for our guests was probably the most significant improvement. Involving our visiting students and their parents in the event was also key.

After they had a chance to do their own science in our laboratory, our guests very much enjoyed the 'flashier' demonstrations the faculty did. We were fortunate to have the Open Laboratory, a large and airy space, for the hands-on and faculty demonstrations. If space is an issue at your location, many of the hands-on demonstrations (except perhaps nylon synthesis) can be done in ordinary places with protection for the floor, such as occurs at the Chem Demo Exchange at ACS meetings. It is possible to do a number of the faculty demonstrations in a lecture hall, as well, though appropriate safety precautions must be implemented and the scale of some demonstrations may need to be adjusted.

For additional information, please contact Craig Fryhle, faculty advisor, at **fryhle@chem.plu.edu**, or Christine Gordon, SAACS chapter president. iC

Celebrating INNOVATION

JUPITER IMAGES

By Rini Paiva and Joyce Ward

IMAGINE IF YOU COULD BE RECOGNIZED and rewarded for research projects you're already conducting! If you've ever heard of the Collegiate Inventors Competition (**www.invent.org/collegiate**), then you know that it can be done.

Since 1990, students from a range of disciplines, including chemistry, have participated in the Collegiate Inventors Competition (CIC). This annual program, offered by the National Inventors Hall of Fame Foundation (NIHFF), awards individual students or teams for innovative work and scientific achievement.

The CIC recognizes original research, discoveries, and inventions that have the potential to receive patent protection. While the focus is clearly on students, the CIC also encourages and recognizes the working relationships between students and their advisors.

Applications are judged based on the originality of the idea, process, or technology, as well as its potential value and usefulness to society and the level of student initiative. Approximately 10-12 individuals or teams are chosen to travel to the location of the final judging and awards ceremony. Past locations for final judging have included Pasadena, CA; New York City, NY; Akron, OH; and Washington, DC.

The CIC allows students to receive recognition beyond regular academic circles and provides financial support that can be difficult to pursue when involved with rigorous and demanding schedules. CIC finalists receive national recognition for their research and a monetary award between $2,000 and $25,000.

The Judging Process

The CIC program receives entries from college and university students worldwide. Three judges review, score, and rank each entry to determine the finalists. Those students who advance to the final judging round have the opportunity to present their research to a judging panel of world-renowned scientists, including inductees in the National Inventors Hall of Fame and representatives from the United States Patent and Trademark Office (USPTO). In 2007, judges included:

- **Robert W. Bower**, CEO, Device Concept, Inc., and Emeritus Professor, University of California
- **Edith M. Flanigen**, Senior Research Fellow, Union Carbide and Fellow University of the Pacific (retired) and Consultant
- **Marcian E. "Ted" Hoff**, Chief Technologist, FTI Teklicon
- **Donald B. Keck**, Vice President and Director of the Office of Research, Corning, Inc.
- **George Smith**, Head, MOS Device Department, AT&T Bell Labs (retired)
- **Rangaswamy Srinivasan**, President UVTech Associates
- **Steve Wozniak**, Co-founder, Apple Inc.

Special guest judges selected by the presenting sponsors, the Abbott Fund and the USPTO, also participated in the final phase of judging. The first, **Jeffrey Y. Pan**, the USPTO representative, serves as Advanced Technology, Global Pharmaceutical Discovery, Abbott. **Jasemine Chambers**, who serves as group director of Biotechnology, the division that oversees the examination of biotechnology, pharmaceutical, and organic chemistry patent applications.

NATIONAL INVENTORS HALL OF FAME

The 2007 final judging panel (pictured from left to right, front row) Edith Flanigen, Jasemine Chambers, Rangaswamy Srinivasan, George Smith (back row, left to right) Don Keck, Robert Bower, Ted Hoff, Jeffrey Pan.

Through this competition, NIHFF and CIC sponsors hope to continuously encourage and recognize outstanding student innovators, and then watch them continue on to stellar heights while pursuing new ideas in the future. Since 1990, chemistry students and others have participated in the CIC. In the following pages are profiles on two recent participants with chemistry-related entries.

2007 Winners

- **Ian Cheong** of Johns Hopkins University won the grand prize for his invention relating to a targeted cancer-fighting therapy.
- **John Dolan** of the University of California, San Francisco won the graduate category for his Dolognawmeter, a device to measure orofacial pain in laboratory testing.
- **Corey Centen and Nilesh Patel** of McMaster University won the undergraduate category for their CPRGlove, a wearable device to aid in teaching and administering CPR.

2007 Finalist

Sadie Bartholomew

In the fall of 2007, Sadie Bartholomew, a recent graduate of Otterbein College in Ohio, advanced to become a CIC finalist.

At Otterbein, Bartholomew's work involved protein research, and she quickly discovered how time-consuming it was to create the protein needed for her work. She knew that other labs used bioreactors (vessels in which cells grow in a nutrient-rich, controlled environment) to create large amounts of protein for research, but her school didn't have the budget for such an expensive piece of equipment.

PHOTO CREDIT HERE

So Bartholomew came up with a solution. After conducting many unsuccessful literature searches for a protocol that was cheap and simple enough to be practical, she began tackling the problem of developing a cost-effective bioreactor on her own. Over two years, she adapted many existing methods in a variety of fields and altered them to fit her system.

A breakthrough moment for Bartholomew came when she found a way to use the Winkler assay for dissolved oxygen, first published in 1888. While using the Winkler method on a microscale had been done in other labs, Bartholomew's approach was unique because she adapted it specifically to facilitate cell culture.

Her challenge was to find a cheap and reliable way to measure dissolved oxygen, a key component for cell growth. She wanted to use the Winkler assay, but realized that the standard approach required up to 0.2 liters of the liquid to be tested, more than she was willing to sacrifice. She scaled down the approach to use just two milliliters of liquid, but her trials always reported more oxygen than they should. The reason, she surmised, was that because there was a small amount of test liquid, the surface area that oxygen could come in contact with was large in proportion to the actual sample, and thus it affected the results. Her answer was to use a small, completely filled screw-cap Eppendorf tube, thereby eliminating surface area and allowing accurate results.

Ultimately, Bartholomew's adaptation allowed her to create a small-scale and economical bioreactor. Her work earned her a spot as a CIC finalist, and she was awed to know that her work was being evaluated by a panel of distinguished judges that included Edith Flanigen, a former Union Carbide chemist who received the Francis P. Garvan-John M. Olin Medal of the ACS and was the first woman to receive the Perkin Medal. In speaking of her experience before the judges, Bartholomew remarked, "It humbles me to realize that these exceptional individuals who have contributed greatly to society with their own inventions have vested their time and energy into fostering the innovative spirit of the next generation."

Bartholomew says that the CIC was a once-in-a-lifetime experience. She notes, "Previously, I had not viewed my work as innovative, but rather a novel means to an end. Simply filling out the application and scanning through hundreds of relevant patents, however, I soon realized that I had created something new and exciting that filled a niche."

Bartholomew also appreciated that all the finalists had an opportunity to come together for judging and the awards event. "Getting to know the other finalists was a highlight to the competition," she says. "We became excited about each other's projects and the future directions in which they would go."

Today, Bartholomew, an active ACS member, is continuing her biochemistry studies as a graduate student at Stanford University.

2006 Undergraduate Winner

Fan Yang

PHOTO CREDIT HERE

In 2006, Fan Yang earned the top undergraduate prize in the CIC for discovering anti-adherent agents to keep bacteria from sticking to contact lenses.

Bacteria can exist in either planktonic (free swimming) form, or in a biofilm form. In the latter form, they have settled down and have attached to solid surfaces. Once attached, the bacteria begin to organize in structured communities and then divide and multiply. During this process, bacteria cells also cement themselves to each other and excrete polymers, forming a protective armor, or biofilm, around the community. Bacteria in biofilms are far more resistant to antimicrobials than are planktonic bacteria. Because some bacteria cannot form their own biofilms, they may join with other species of bacteria that have established biofilms.

Yang's interest in the subject began when she was in 6th grade, when she conducted an experiment growing bacteria. Two years later, Yang assisted with a project at the Biofilm Research Center at the University of California Davis Medical School, where she used the "one bead, one compound" (OBOC) library approach to combinatorial chemistry.

Combinatorial chemistry is a non-traditional approach to quickly synthesizing large amounts of different compounds at the same time. Organic chemists primarily use combinatorial methods when searching for new drugs. They can combine several chemical building blocks in many different ways to get a large number of different compounds, a collection known as a chemical library.

In the OBOC approach, a library of microscopic polystyrene beads is covered with a single candidate compound. One experiment is conducted on thousands of these beads at the same time. Those beads that suitably react are further studied.

When Yang was a sophomore in high school, she was discouraged from wearing contact lenses by warnings about possible infection. As a result, her longstanding interest in bacteria converged with her new desire to be free from wearing glasses. She realized from her previous research that eye infection from contact lenses was a biofilm problem.

Yang started to investigate the sources of biofilm. "Instead of looking for something that binds to bacteria, why don't we look for something that doesn't bind to bacteria? I found that no one had had success with anti-adhesion therapy because the mechanism for bacterial adhesion is so complicated. I thought, instead of spending time trying to figure out why bacteria adhere, why couldn't we spend more time on finding something that doesn't allow bacteria to bind? Among the millions of compounds, surely there is one that doesn't permit bacterial adhesion."

After reading a scientific paper by Xiaobing Wang, a renowned researcher in OBOC chemistry, Yang contacted him to see if she could volunteer in his laboratory and use his library to research anti-adherents for contact lenses. Impressed with the precociousness of the high schooler, Wang sent Yang some beads.

By the time Yang entered college and the CIC, she had identified and tested three compounds from Wang's library that prevented bacteria from adhering to contact lenses. Her research also has the potential of being used in the human body and in medical devices. iC

So ... How Can You Enter?

The official application, a list of FAQs, and complete instructions are available at **www.invent.org/collegiate**. Entries must be submitted on the official application form and postmarked by May 16, 2008. A brief description of the invention, a letter from your faculty advisor, a literature/patent search and summary, and any relevant supporting materials should also be submitted.

To be eligible for the CIC, a student must be enrolled in any college or university in the United States or Canada for at least a portion of the 12-month period prior to submitting an entry. In the case of a team, at least one member must meet the full-time eligibility criteria.

It is important that the project or invention be "reduced to practice." That is, the invention must be more than a mere idea. It must be complete, operable, and the student must present some evidence of successful application. Also, the work must be capable of being reproduced. Finally, the submission must be primarily the work of a student or team of students with a faculty advisor.

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Rini Paiva is executive director of the National Inventors Hall of Fame and oversees inductee and public relations for the National Inventors Hall of Fame Foundation (NIHFF). **Joyce Ward** is director of program support and intellectual property for NIHFF.

Tricks of the Trade

Successful Tactics for Promoting Your Student Affiliates Chapter

By Beatriz H. Perez, Karla Schallies, Celeo Guifarro, and Adam Marchetti

THINK BACK TO YOUR FRESHMAN YEAR, WHEN you first joined the American Chemical Society Student Affiliates Chapter. Being a chemistry major, you knew it was something you ought do, but you were still probably a bit apprehensive about it. Just imagine how non-chemistry majors feel when they consider joining the chemistry club or participating in its activities. The word "chemical" alone can hold many students back from joining the ACS Student Affiliate chapter.

For Student Affiliates chapters, one of the greatest challenges is to bring new members — who may or may not be chemistry majors — into the chapter. At Suffolk University, we think of promoting membership as one of the "tricks of the trade" to having a successful chapter. We invest our time and effort into promoting the chapter and its activities and, in return, we see the membership grow. We also receive great satisfaction in seeing an activity go from the planning stage to a successful event.

How PR officers can help

One of the big reasons why the Suffolk University Student Affiliates chapter has been so successful is because we have made it a standard practice to have a public relations (PR) officer on our board. Our PR officer's main responsibilities include promoting the chapter's activities, recruiting new members — both science and non-science majors — and retaining current active members. However, the PR officer is not the only person who promotes the chapter. The chapter members also work as a team to recruit and retain members.

Suffolk is a small university located in the heart of Boston. There is always a lot going on, and many other school clubs and attractions run at the same time as our events. Because of this, one of our main goals has been to devise better ways of attracting members and letting students know about our chapter.

We use all of the promotion vehicles available to tell people about our activities and membership. We are delighted to share our recruitment and retention efforts with you. Check out what we do! We think these techniques will help increase participation in events and membership in your chemistry club too.

As always – e-mail rocks!

E-mail has long been the most efficient way to recruit new members from diverse backgrounds and majors. It's a fast, easy, and essentially free way to promote our chapter and its activities. We send e-mail reminders to members to help keep them up-to-date on chapter plans and to seek assistance with events. We also design pamphlets showcasing our activities for either the fall or spring semesters, and e-mail them to members and other students. This helps recipients get organized and have ready access to the dates and times of our events.

Office space – a place to collaborate

The Student Affiliates chapter at Suffolk has its own office located in a central place on campus, where we can meet, plan, and hold activities. This has enabled us to hear everyone's opinions in a relaxed environment. Since we are all friends, the chapter has grown into something fun to do together. What's really great is that in addition to members who are chemistry/biochemistry majors hanging out, a lot of biology, engineering, physics, and mathematics majors also stop by. Having the office has been a great way to get new members with different backgrounds interacting and offering new perspectives for a more diverse organization.

Use your school's online resources

We use the university's "CampusCruiser" Web site, an interactive portal for students. It allows students to check the chapter's website, become members, upload pictures and files, and post announcements. We also use this website to post job opportunities (the Web site can be accessed at **http://prod.campuscruiser.com/PageServlet?pg=clubs_welcome&tg=ClubWelcome&cx=22.164-5.4636)**

Let the flyers fly!

Our chapter also creates eye-catching flyers to advertise events, which we post on boards around campus, place in professors' and students' mailboxes, and attach to e-mail reminders. This way, everyone knows which activity is coming up next.

Use the World Wide Web!

Web promotion has probably been our most innovative method in recent years. We created a chapter Web site on "Facebook." This interactive website enables students from different universities to communicate with each other and find common interests. We opened a "group" page available to the Suffolk network called "American Chemical Society." The chapter administrator posts flyers to the site and invites members from our list and from members' contact lists to our events. Facebook has been a great tool for advertising our activities. It has enabled us to get a larger turnout at events and to recruit new members who are not science majors.

Last but not least: Get EVERYONE involved

Professors and staff members are key components in our success. They interact with us and help us advertise our events in their classrooms. Their advice and guidance have been immensely valuable, and we truly appreciate their efforts!

We believe the Suffolk University Student Affiliates chapter has been so successful because we make full use of the available tools to promote and advertise our chapter and its activities. We have been able to recruit more members who do not have chemistry backgrounds, and have grown stronger and more united. The inflow of members with different backgrounds and interests has been a great help in planning events. We have been able to offer activities that appeal to more students than we once thought possible.

We encourage other Student Affiliates chapters to create a PR position, and to find new and creative ways to promote their chapters. Having a public relations officer is of great help when it comes to advertising events and letting people know what we are planning next! iC

Participate in school events

To showcase our chapter, members participate in campus-wide activities offered by the university. At these events, we set up tables and show movies and slideshows. We also provide handouts and flyers promoting events, seeking new members, and offering giveaways. This is a great way to get to know new students, especially freshmen. We try to help them relate to what our chapter does, even though they may not be chemistry majors. Plus, people always love the giveaways we offer.

SUFFOLK UNIVERSITY

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Calling all music lovers!

At Suffolk University we have a wonderful radio station that is run for and by students who love to listen to music. Because the station is very popular and reaches students who otherwise wouldn't hear about our activities, it is also an excellent place for advertising our events on campus. We try to make our announcements fun and light so that people remember the activities and become aware of our chapter. It's a favorite tradition every October 23 to hear the station announce, "Happy Mole Day, Everyone!"

Beatriz H. Perez, president of the Suffolk University SAACS chapter in 2006-2007 and graduated in with a B.S. in biology. **Karla Schallies** was treasurer the same academic year, and graduated with a B.S. in biology. **Celeo Guifarro** was chapter secretary in 2006-2007 academic year and graduated in 2007 with a B.S. in biochemistry. **Adam Marchetti**, public relations officer in 2006-2007 academic year, is currently chapter president. He will be graduating in May with a B.S. in biochemistry.

Are You Up for the Challenge?

By Lisa V. Brown

WHAT'S THE FIRST THING THAT YOU THINK OF when someone talks about 'chemistry in the classroom'? Most would probably say chemistry demonstrations, in which college clubs or industry representatives perform fun science experiments for wide-eyed youngsters.

But the term can also describe a far different type of activity: fifth- through eighth-graders competing to show their knowledge of isotopes, amorphous solids, polymers, and radioactivity. That's exactly what the **Chemical Educational Foundation (CEF)** has been doing across the country with the *You Be The Chemist* (YBTC) Challenge.

YBTC competitions are structured in a question-and-answer format, and students are given study guides to prepare for regional, state, and national levels. Now in its fourth year, the program has more than tripled in size since it began. Currently, it involves over 10,000 students at approximately 30 sites throughout 14 states – bringing schools, families, and chemical companies together for the sake of science education.

During the 2006-07 school year, the SAACS chapter at Louisiana State University (LSU) in Baton Rouge had an incredible opportunity to participate in the YBTC Challenge. CEF Programs and Outreach Coordinator Corianne Bradley contacted our SAACS faculty advisor, Paul Russo (who is also a CEF Program Committee member) to ask if our chapter's members could assist in composing multiple-choice questions and revising the study guides that would be distributed to all of the Challenge sites.

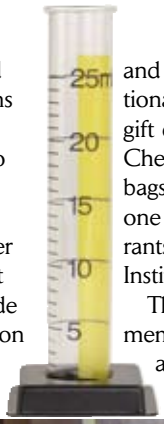
In previous years, all levels of the competition used only one study guide, and much of the material had been compiled by CEF staff and proofread by chemical industry chemists. As the success and size of the Challenge had grown, CEF wanted to make the study guides progressively more advanced, so they needed more than just proofreaders to discern how the material was to be organized. So they sought out volunteer college students to take on the challenge of providing fresh scientific perspectives for young audiences. Excited by a new form of outreach and a great learning experience, the members of our SAACS chapter gladly accepted.

LOUISIANA STATE UNIVERSITY

Above: Participants of the 2007 National You Be The Chemist Challenge. Left: The top three winners, Alex Ball, Brook Bi, and Christopher Pillay, proudly display their trophies.

Facing the Challenge

CEF sent us a compilation of old study guide materials in September 2006, and our goal was to edit and reorganize the information into three levels: regional, state, and national. A core group of four to six SAACS members worked on the project, along with two chemistry graduate students. As we flipped through the material, we were surprised to see that middle schoolers were learning concepts that were usually not introduced until high school or college, such as periodic trends, chemical reactions, electron configurations, and acid-base chemistry.



Beginning with the Regional Study Guide, we scheduled meetings apart from regular SAACS activities to make plans for revisions. Sometimes, we even brought our laptops to local coffee shops or the lobby of the chemistry building to work on it together. The new study guide was slowly but surely being formed as we gained skills in communication, editing, and presenting written scientific material to younger audiences. Throughout the process, the club president kept in touch with CEF to make sure we produced a study guide that was consistent with their needs. Having only one person act as the liaison helped to minimize miscommunication between the parties.

After about two months of hard work, the Regional Study Guide was finally completed. Some of our major changes included: adding a hyperlinked table of contents, inserting 3D molecular images, restructuring the material so that it flowed logically from one topic to the next, and emphasizing primary concepts by labeling extra information as 'quick facts.' CEF was extremely pleased with the outcome.

We continued to work with them in writing multiple-choice questions based on the Regional Study Guide. This was very eye-opening for us because we were actually writing questions for others to be tested on, rather than answering questions that our professors gave to us. Also, a greater number of SAACS members could help because it was more straightforward than editing the study guide material.

As the school year continued, the chapter assisted in producing the State and National Study Guides and question banks, each of which contained more advanced material than the previous level. CEF also gave us the liberty to add new concepts, so members composed sections relating to chemical nomenclature, polymers, and environmental chemistry. Other ideas such as electrochemistry and nanotechnology were also considered.

Big payoff

At the end of the spring semester, in appreciation of our help, CEF invited Russo and two SAACS members to attend the National YBTC Challenge in Philadelphia. Thanks to additional funding provided by the LSU Chemistry Department, two additional members were also able to attend. Three chapter members served as moderators, reading aloud the same questions they had composed months before; the fourth served as scorekeeper with a CEF representative, and Russo served on the judging panel.

The competition took place at the Chemical Heritage Foundation (CHF), where 12 anxious students represented the top 0.1% of an estimated 10,000 participants. Nearly 80 eager family members and industry sponsors supported them in the audience. After a series of difficult rounds, sixth-grader Brook Bi from Reading, PA, won first place in the competition. Alex Ball, an eighth-grader from Mount Prospect, IL, and Christopher Pillay, a seventh-grader from Elk Grove Village, IL, won second and third places, respectively. The winners received educational savings bonds from CEF, while all contestants received gift certificates to the Discovery Channel Store, CHEMC3000 Chemistry Sets, and YBTC Challenge plaques, T-shirts, book bags, and water bottles. In addition to the competition, everyone had a chance to explore Philadelphia, enjoy local restaurants, and tour the scientific wonders at CHF and the Franklin Institute.

The entire experience was just as rewarding for us SAACS members as it was for the students, parents, and sponsors who attended. After almost an entire school year of dedicated work behind the scenes, we met the students and their supportive families who directly benefited from our efforts. The project was an incredible learning experience for all of us, and we knew that we were making a positive impact on the science education of middle school students across the country.

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LSU SAACS members and chemistry graduate students lay down the groundwork of the newly revised study guide. Left to Right: Mike DeLee, Amin Hamideh, Lisa Brown, Arther Gates, and Damien Narcisse

How can you help?

The YBTC Challenge is continuing to grow, and SAACS chapters everywhere are encouraged to get involved. One of the simplest and best ways to help is to write multiple-choice questions based on the study guides for the regional, state, and national level competitions. Chapters can contribute even more by writing new material for the study guides, which are revised each year by CEF. SAACS members can also get involved locally by helping prep students from existing Challenge sites or by taking action to start a Challenge in your area. For more information, visit the CEF website at **http://www,chemed.org**, or contact CEF's Corianne Bradley at **cbradley@chemed.org** or 703-527-6223, ext. 116. IC

Lisa H. Brown was the 2006-07 president of SAACS at LSU and is now a graduate student in the Department of Chemistry at Rice University, Houston, TX.

Searching for a Greener Plywood

By O'dell Hicks, Elizabet Martinez, Ragan McGinty, Adrian Dunson, and Linda Schultz

Tarleton State University's Chemvention 2006 Experience

CHEMVENTION IS AN ANNUAL COMPETITION, begun in 2003, that challenges Student Affiliates chapters to solve problems presented by the American Chemical Society. These problems have tested students' scientific research skills (such as the challenge in 2003 to develop a way to measure the amount of oxygen in the air) as well as teaching skills (such as the 2005 contest to develop a toy to teach a concept of chemistry). All projects also have a budget limitation – typically $250.

Tarleton State University's Student Affiliates chapter has participated in the Chemvention competition since it began, and each year has placed as a finalist. Our entry from 2004 resulted in a publication in the *Journal of Chemical Education*, and two "toys" our team developed for the 2005 competition will also be highlighted in the April 2008 edition of the *Journal*. We're also pleased to note that Tarleton was a finalist in the 2007 competition. Being involved in the activity was not only fun, but also gave us experience in teamwork, hands-on practice in research skills, and insights into our own career possibilities.

Going for the gold … in green!

The competition for 2006 called for the development of a "green" building material. After a bit of brainstorming, our team decided to try replacing the wood core of plywood – a staple in the construction industry – with post-consumer waste paper such as newspaper and copier paper. This idea addresses two problems simultaneously: the decreasing availability of high quality timber and the increasing quantity of paper waste.

Plywood is composed of thin layers of glued, pressed wood called veneers. For our entry, we tested three different veneer substitutions: newspaper, copier paper, and paper towels. We glued together sheets of the papers using Gorilla Glue, Elmer's Wood Glue, and a soy-based marine glue made using a process described in a recent journal article. Unfortunately, we had to make several alterations to the synthetic procedure due to budget constraints, and the final product was not satisfactory.

For each sample, the core was surrounded by thin sheets of plywood. Plywood bonded with Elmer's or marine glue was placed in a 120° C oven for 10 minutes with pressure applied from 50 kg of steel bricks. Gorilla Glue oozed too much for this procedure, so samples bonded with it were held together with binder clips. All samples were allowed to cool and dry for 10 hours and then cut into three uniformly sized sections.

Outdoor plywood is obviously subject to the elements. Therefore, to simulate the effect of rain and shine, we put some of the plywood samples through a series of soaking and drying cycles. Samples were then tested against a commercially produced piece of 3-ply plywood, which served as a control. To meet the program deadline, we occasionally had to work late into the evening doing the experiments – but even so, we succeeded at making it a fun experience.

Stress testing was done on a low-range nonmetallic unitester in the university's Industrial Technology Laboratory, with the help of James Smith of the Department of Engineering

TARLETON STATE UNIVERSITY

Dunson and McGinty applying glues to paper cores.

	Not soaked	One soak/dry	Two soaks/dry
	Failure (psi)	Failure (psi)	Failure (psi)
Control	155	100	100
1/4" Plywood Core			
Elmer's	150	155	90
Gorilla	185	150	160
Marine	80	NB	NB
Newspaper Core			
Elmer's	60	60	40
Gorilla	250	190	200
Marine	-	-	-
Copy Paper Core			
Elmer's	100	75	95
Gorilla	340	290	250
Marine	NB	NB	NB
Paper Towel Core			
Elmer's	90	80v	40
Gorilla	200	170	130
Marine	NB	NB	NB

Table 1. Stress Test Results (NB = no bond)

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Samples with Gorilla Glue bound cores drying.

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Martinez and Hicks stress testing samples.

Technology. The soy-based marine glue failed to bond the veneer layers. Results are summarized in the table below, where failure is the maximum pressure a sample could withstand. (see Table 1 on next page).

These results indicated that waste paper (especially copier paper) glued together with Gorilla Glue (a urethane polymer) was superior in strength to the commercially produced control sample. This superiority was even more apparent under simulated weathering conditions. Therefore, such a veneer substitution could be a viable option for a more environmentally-friendly building material.

Benefits that stick with you

In the short-term, we had fun working on the project, and enjoyed the teamwork. In addition, as one of only two schools nationally to actually complete the task, we experienced personal satisfaction in gaining recognition for our university. We also felt that the project helped us achieve a greater environmental awareness and appreciation of the necessity for increased recycling and resource conservation.

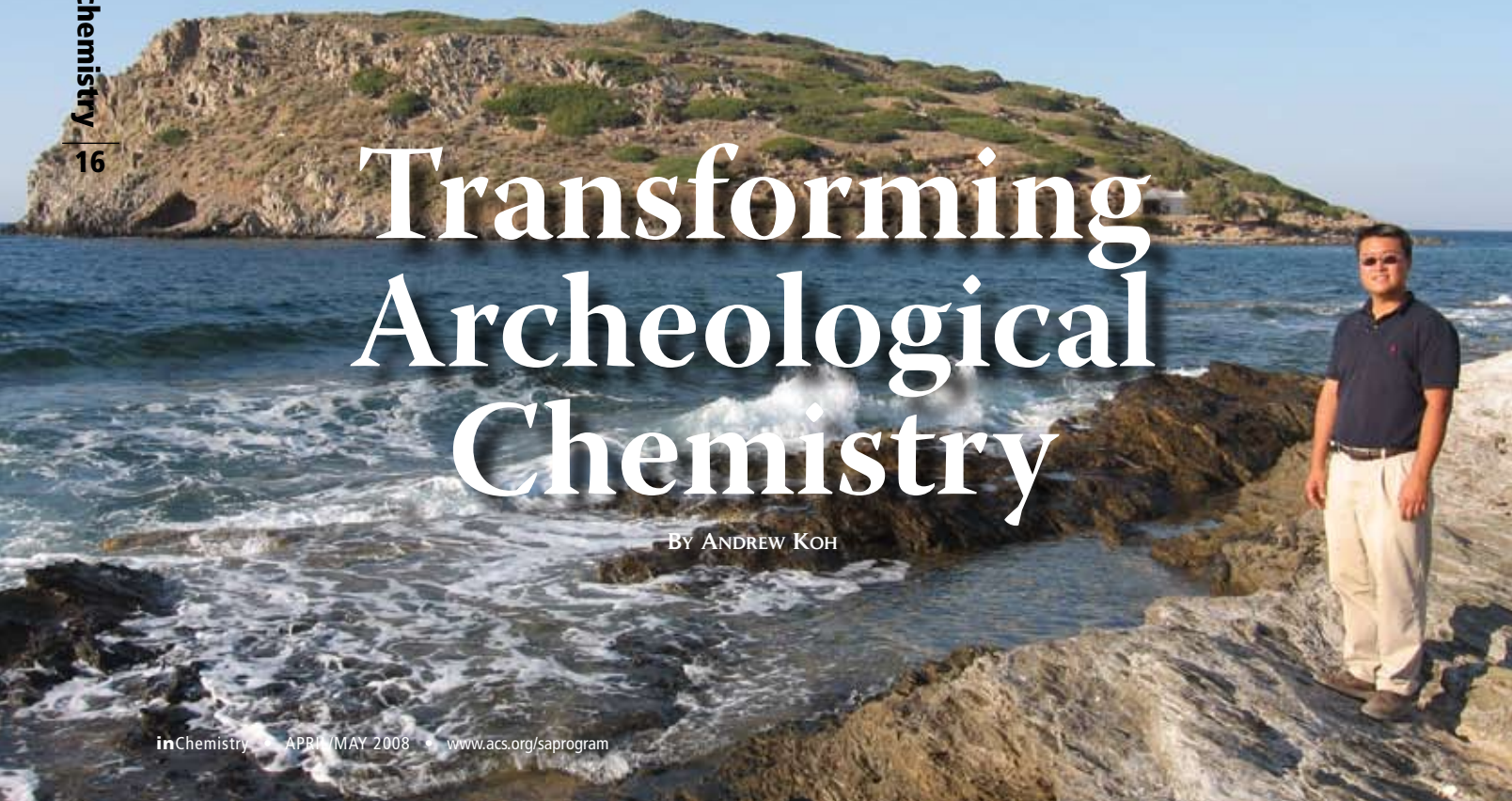
Our group felt that the greatest long-term benefit came from the opportunity to attend national ACS meetings. We used the prize money to help fund transportation for two students to attend the ACS National Meeting in Chicago. There, they had the opportunity to attend events and scientific presentations, and the chance to set up future networking prospects.

This project was both intellectually and physically challenging for the team, and was also an enjoyable learning experience. It provided an opportunity to work side by side with professors, and also with fellow students. It was also a chance to work on a bigger project than a typical class-related assignment, without the guidelines laid out as to specifically what one has to do. We highly recommend getting your chapter involved in this program – you'll never know what you're missing until you try it! IC

O'Dell Hicks, former Tarleton SAACS president and vice president, is a senior chemistry major. **Elizabet Martinez** is SAACS president and [to come]. **Ragan McGinty** is [to come]. **Adrian Dunson**, SAACS historian and past secretary, is a senior majoring in biomedical science and plans to attend medical school in the fall. **Linda Schultz**, a professor of chemistry in Tarleton's Department of Chemistry, Geosciences, and Environmental Science, leads an active research program and serves as unofficial sponsor of the Chemvention team.

Transforming Archeological Chemistry

By Andrew Koh



As a pioneer in the emerging field of archeochemistry, I'm working at the forefront of some of the most exciting inquiries into ancient cultures. By using chemical analysis to extract and identify trace substances present on artifacts – substances that used to be washed away as a routine part of the process – we're gaining unprecedented insights into the way ancient peoples lived.

Looking for direction

Archeochemistry is starting to revolutionize the process of examining and learning about archaeological finds, providing a sharper lens for us to use when explaining material culture. Yet, if it hadn't been for the intervention of the assistant director of admissions at The University of Pennsylvania's School of Medicine – and some other timely breaks – I might never have found myself with this opportunity of a lifetime.

As a junior at the University of Illinois at Urbana-Champaign in 1994, I found myself at a crossroads. Having made enough progress towards my requirements as a biophysics major, I faced the daunting decision of whether to graduate that school year. Like many upperclassmen, I naturally asked myself, "what next?"

My initial thought was that I had not yet found the correct industry to match my interests. As a result of volunteering at a local hospital for several years, I knew medicine was not for me. A short-term internship at a well-known pharmaceutical company outside Chicago that summer put doubts in my mind whether that route was right for me either.

My solution was a simple one: stay in school for my senior year and use the time to plot a future course. Little did I know how far afield I would actually end up when I concluded my formal education with a Ph.D. in archaeology from the University of Pennsylvania.

Going from a B.S. in biophysics to a Ph.D. program in archaeology is not a common or easy transition. But it wasn't until years later that I learned how narrowly I made it. In fact, the University of Pennsylvania's admissions committee could not quite figure out what to do with my application. My undergraduate grades were quite good for a science major and my GRE scores were very strong. But how does one compare an "A" in organic chemistry lab with an "A" in intermediate Latin?

To help solve its dilemma, the committee unconventionally consulted with the assistant director of admissions of the School of Medicine, who not only endorsed my undergraduate education, but went so far as to submit a recommendation for my file! Before I knew it, I found myself sitting deep in the Beaux Arts chambers of the University of Pennsylvania Museum of Archaeology and Anthropology, discussing some of the most recent developments and issues in archaeology.

Understanding the tradition

Since the earliest days of archaeology, when an excavator in the field would find a piece of pottery, his or her first step would be to wash off any dirt and substances. Doing so was how they were able to examine the decoration and style of the piece – and thus determine its culture and rough age. This was only the first stage in the process; when the piece went to the conservator, washing with deionized water and acid was also common practice.

Historically, chemistry applications in archaeology were largely methodological in nature, with little concern for the archaeological concerns at hand. Artifacts were sent to distant labs usually many years after excavation, and pulverized for residue analysis, but not before they had been washed, mended, and handled by numerous people.

The birth of a new approach

Needless to say, destroying artifacts in order to analyze them is not an appetizing option for archeologists. The practice severely slows down the process and also makes excavation directors reluctant to supply objects for analysis.

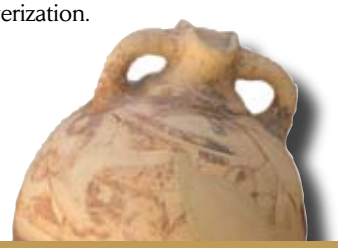
When I started my research in 2003, I was determined to do things differently. I wanted to devise a process that was archaeologically viable – something that answered archaeological questions – as well as comprehensive, fully-integrated, and non-destructive. The result was the ARCHEM project, a process for extracting residues in the field and identifying them. This also began the transformation of archeological chemistry to archeochemistry.

To realize its full potential, archeochemistry needed a comprehensive library of organic residues. With it, one could answer questions that were of utmost importance to archaeologists – including the function of certain artifact shapes and the spaces and groups in which they are found; the nature of their use over long periods of time; and the implications these answers hold for understanding the original users' production, consumption, and trade.

Residues also needed to be extracted immediately after excavation, and before washing and mending by conservators. Not only does the conservation process destroy traces of organics, but the further removed in time an object is from its point of excavation, the more likely it is that contaminants have been introduced.

After several summers of refinement that involved the patience, faith, and financial support of numerous colleagues, we have succeeded at seamlessly integrating a process for extraction into the overall conservation process. Its success is due in large part to the purchase of a Büchi Polyevaporator, which allows for the gentle boiling, agitation, and isolation of residues through parallel evaporation, all in a closed system under vacuum pressure. This effectively sped up the extraction process at least five-fold, helping to realize the dream of efficiently extracting residues from every object that enters conservation.

The ARCHEM project has made extracting residues from unmolested artifacts an issue of prime importance and demonstrated that an adequate number of samples can be isolated – without pulverization.



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Solving the riddle of the vats....and other mysteries

One of the most exciting discoveries made possible through the ARCHEM project involved two vats located in a Minoan settlement on Mochlos, a small island off the island of Crete. Previously, archaeologists knew only that there were two vats in adjoining, unidentifiable rooms.

Using ARCHEM's revolutionary extraction tools and processes, I have defined one as a vat for making perfumed oil. Moreover, I have shed light onto a complex workshop that produced the finest perfumes and medicines using cistus (a major ingredient today in Chanel No. 5), wormwood, linden flowers, coriander, ferula, and olive oil.

I can confidently state that the other vat was used for wine production, likely at its earliest stages, based on the discovery of tartaric acid without any resins that would signal a later stage of production.

Other mysteries have also been solved. Little juglets long called "creamers" based on their shape, have been shown to have actually contained milk. A triton shell found in a foundation deposit produced resinated wine, demonstrating that it was a practical implement with possible cultic significance when the space was ritually dedicated. These observations are just a glimmer of the kinds of insights into the details and textures of ancient peoples' daily lives that are impossible to gain solely through standard methods of archaeological inquiry.

Integrating science and art

Scholars have been saying for decades that science is the future of archaeology. Yet, my proposal of inserting an extraction process between the excavators and conservators had the potential of threatening a time-honored process. Being intimately familiar with both archeology and the sciences gave me the credibility to convince others to use this new approach.

For those aspiring to jobs as archaeochemists, training as both a scientist and archaeologist is of vital importance. In the end, to fully participate in the research dialogue, intense training as an archaeologist is necessary, making a Ph.D. compulsory. Though it is also possible to major in the humanities as an undergraduate and continue on as an archaeological scientist, I am convinced that a holder of a comprehensive B.S. holds a significant advantage, especially as archaeology becomes increasingly multidisciplinary in the 21st century.

But like most disciplines in the humanities, and perhaps even more so, there are numerous pitfalls to intertwining sciences with traditional disciplines. Universities and foundations typically fund and hire based on your attributes as a "fish" or a "fowl" – but rarely as both.

Fortunately, after sticking with my plan and carefully developing a solid methodology, I'm starting to get the kind of feedback that makes it feel very worthwhile. Scholars have told me that the field may not really understand or appreciate what we're doing for another 10 or 20 years. This prediction has inspired me to continue seeking out colleagues, explaining the nature and value of the ARCHEM project. Doing so will help to ensure that this innovative approach is not just a sensation, but also an improvement to the discipline that lasts. IC

Andrew Koh received his B.S. in biophysics from the University of Illinois at Urbana-Champaign and his Ph.D. from the Art and Archaeology of the Mediterranean World program at the University of Pennsylvania. He now teaches classical studies and material culture to the students at Wayne State University in Detroit, MI and conducts fieldwork in Greece every summer.

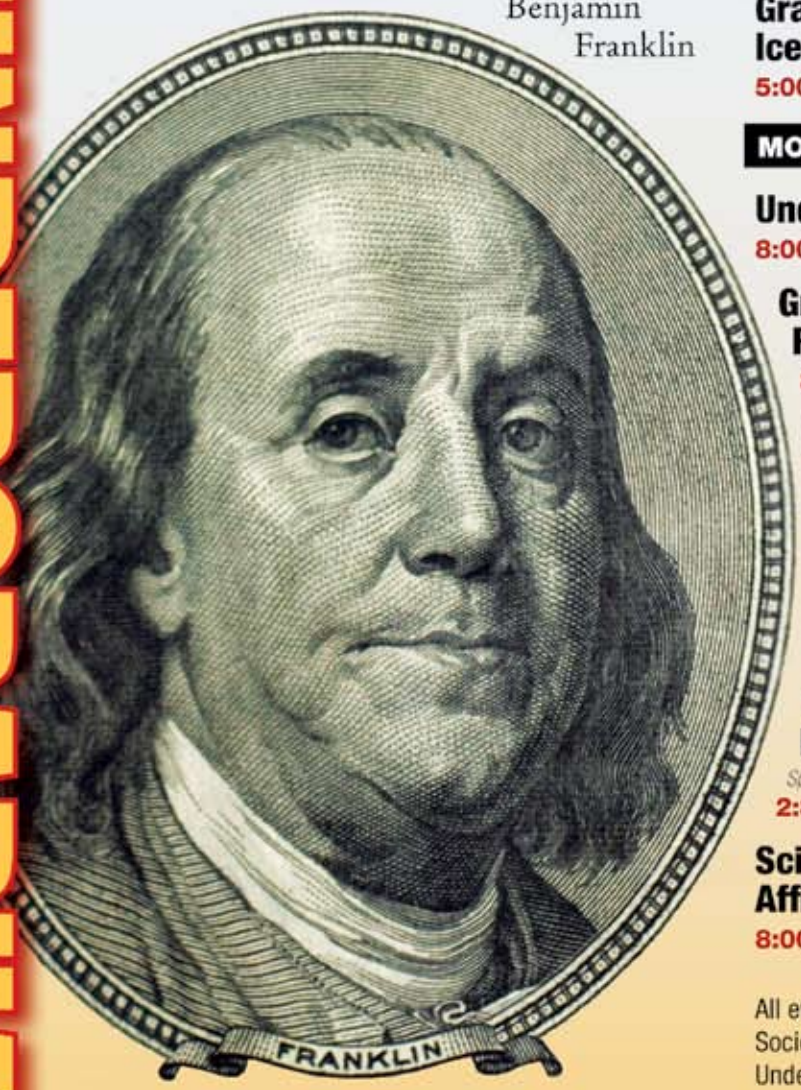
ARCHEM

236th ACS National Meeting

AUGUST 17-21, 2008
PHILADELPHIA, PA

"An investment in knowledge always pays the best interest."

Benjamin Franklin



UNDERGRADUATE PROGRAM

SUNDAY, AUGUST 17, 2008

Undergraduate Hospitality Center
8:00 A.M. – 5:00 P.M.

How to Be a Green Chemistry Chapter Workshop
9:30 – 10:45 A.M.

Chemistry in Action: Reaching Out with Community Events and Classroom Activities
11:00 A.M. – 1:00 P.M.

Global Change Symposium
1:30 – 3:00 P.M.

Graduate School Reality Check
3:30 – 5:00 P.M.

Graduate School Recruiting Ice Cream Social
5:00 – 6:30 P.M.

MONDAY, AUGUST 18, 2008

Undergraduate Hospitality Center
8:00 A.M. – 5:00 P.M.

Graduate School Recruiting Breakfast
8:30 – 10:30 A.M.

Clean Energy Symposium
9:30 – 11:00 A.M.

Eminent Scientist Lecture and Luncheon
Featuring F. Sherwood Rowland
11:30 A.M. – 1:00 P.M.

Undergraduate Research Poster Session
Sponsored by the ACS Division of Chemical Education
2:30 – 4:30 P.M.

Sci-Mix/Successful Student Affiliates Chapter Posters
8:00 – 10:00 P.M.

All events are sponsored or co-sponsored by the Society Committee on Education Task Force on Undergraduate Programming. **Chair: Etta Gravely**, North Carolina A&T University, Greensboro. **Program Chair: Julie Mosher**, University of Toledo, OH.

Program format and times are subject to change. Please consult the final program.

Chemistry in Old Philadelphia

By James Bohning

This fall over 15,000 chemists will descend on Philadelphia to attend the 236th National American Chemical Society meeting. If you are among those traveling to the City of Brotherly Love, don't miss out on a great opportunity to visit sites and learn about how Philadelphia and chemistry have a long and interesting history.

Historic Philadelphia is more than a cracked bell, and a determined visitor could spend many days exploring all of the historic sites. The heart of the historic district is the 55-acre Independence National Historic Park, covering 20 city blocks. A stop at the National Park Service Visitor Center at 6th and Market Streets is the best way to orient yourself to the area and plan what you want to see. The Liberty Bell is in its new center one block away at 6th and Chestnut, but (free) tickets are required to tour Independence Hall across the Street.

Of more significance to science students, however, is the **American Philosophical Society (APS)**, just a little further east on Chestnut Street. Founded by Benjamin Franklin in 1743 to promote useful knowledge in the sciences and humanities, APS recently opened a museum in its original building located on 5th Street just south of Chestnut. It was in this building on March 10, 1797, that 23 people gathered for the organization's monthly meeting chaired by APS President Thomas Jefferson. In attendance was Joseph Priestley, the discoverer of oxygen.

Priestley passed through Philadelphia in 1794 on his way to Northumberland, a town in north central Pennsylvania, to join his sons who had started a large land development program there. He declined the offer of the chemistry professorship at the University of Pennsylvania offered by Benjamin Rush, a signer of the Declaration of Independence, physician, and professor of chemistry at the university. Priestley visited Philadelphia four more times before his death in 1804, often meeting with Rush. A landscaped garden now exists on the site of the house where Rush and Priestley met at 3rd and Walnut Streets.

M. KENNEDY FOR GPTMC

Independence National Historical Park

In 1796 Priestley preached a series of sermons at the Universalist Church at 412 Lombard Street (between 4th and 5th Streets) that were attended by a large audience, including John Adams and Thomas Jefferson, who were friends of Priestley. A direct result was the formation of the first Unitarian Church in the United States. Now Kesher Israel, the building is the only one left in the world in which Priestley preached.

PHILADELPHIA CONVENTION & VISITORS BUREAU

Benjamin Franklin's gravesite at Christ Church Burial Ground.

No other scientist is more directly identified with Philadelphia than **Benjamin Franklin**, and if you're lucky you might see Ben (aka Ralph Archbold) wandering the Independence Park area. If you do, feel free to talk to him about science.

To learn more about Franklin, the reproduction of his print shop at 320 Market Street is a good place to start. Then proceed into Franklin Court, where you can see a ghost outline of Franklin's home and an underground museum devoted to his life and inventions. Franklin and Priestley were close friends, and it was Franklin who encouraged Priestley to follow his interests in science. Not coincidentally, one of

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PHILADELPHIA CONVENTION & VISITORS BUREAU

Philadelphia Visitors Center

Priestley's first books was on the history of electricity.

Exit Franklin Court south to Chestnut Street and turn left to the **Chemical Heritage Foundation (CHF)** at 315 Chestnut Street. "Dedicated to preserving and promoting the progress of science, CHF maintains world-class collections, including instruments and apparatus, rare books, fine art, and the personal papers of prominent scientists, all related to the chemical and molecular sciences." A new permanent exhibit space is scheduled to open in time for the ACS meeting in the fall of 2008. In addition, CHF has an extensive collection of paintings related to alchemy that are on public view.

Two blocks north and west, on 4th Street near Arch Street, is the Holiday Inn. Two plaques are mounted on the wall of the parking garage: one commemorates Joseph Priestley and the founding of the Unitarian Church in the United States, and the other marks the site of the original buildings of the University of Pennsylvania, founded as the Academy and College of Philadelphia by Benjamin Franklin in 1751 with the "nation's first modern liberal arts curriculum."

One block west on Arch at 5th Street is the **United States Mint**. James Curtis Booth, American Chemical Society president from 1883–1885, was the melter and refiner at this mint for 40 years. Booth developed methods of refining the large quantities of gold processed by the mint following the California Gold Rush. Across the street from the mint is Franklin's grave in the Christ Church Burial Ground.

Visit the Cradle of Liberty—and Chemistry

Treat yourself to a sneak preview of two new exhibitions at the Chemical Heritage Foundation (CHF)—"Making Modernity" and "Molecules That Matter". "Making Modernity" features artifacts from across CHF's collections and library and brings the exciting untold story of the chemical and molecular sciences to life. "Molecules That Matter" showcases ten organic molecules that profoundly altered our world in the twentieth century. This exhibition is organized in partnership with **The Frances Young Tang Teaching Museum and Art Gallery at Skidmore College**.

The official opening for these exhibitions is October 3, but the facility will be opened to ACS Philadelphia attendees from 1-6 pm on Sunday, August 16; 10 am – 7 pm, Monday – Wednesday; and 10am – 4 pm Thursday and Friday of the week of the meeting.

CHF maintains world-class collections, including instruments and apparatus, rare books, fine art, and the personal papers of prominent scientists, all related to the chemical and molecular sciences. CHF's programs and publications provide insight on subjects ranging from the social impact of nanotechnology to alchemy's influence on modern science.

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CHF's programs and publications cover topics ranging from the social impact of nanotechnology to alchemy's influence on modern science. For more information, go to **www.chemicalheritage.org**

This mini-tour of chemical sites would not be complete without a stop on the campus of the University of Pennsylvania at the statue of **Edgar Fahs Smith** on South 34th Street between Walnut and Spruce. Smith was provost of the University for 10 years and was ACS president in 1898, 1921, and 1922. He was cofounder of both the ACS Division of the History of Chemistry and the ACS Division of Chemical Education. His collection of books and artifacts relating to the history of chemistry, now housed in the Van Pelt Library, is among the finest in the world. Smith's statue is replete with chemical symbols, but the most significant part is the monster under his foot, a gargoyle inserted by the sculptor to represent Smith, as an analytical chemist, stamping out error!


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Statue of Edgar Fahs Smith, ACS President in 1898, 1921, and 1922.

So while in Philadelphia, either attending the meeting or just visiting, take time out to walk the mini-tour to enrich your understanding of the history of chemistry. iC

James J. Bohning is Professor Emeritus of Chemistry at Wilkes University and currently a CESAR Fellow at Lehigh University.

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Taking Chemistry to the Max — at SERMACS

By John G. Kaup and Megan Fresia

The Student Affiliates chapters at Clemson and Furman Universities presented the Undergraduate Program at 59th Southeast Regional Meeting of the American Chemical Society (SERMACS 2007). It was an incredible experience, with more than 300 undergraduates attending. As two active participants in the conference, we are excited to share some of our highlights from this experience.

Timing is everything

Just before the official undergraduate program events began, undergraduate conference attendees and other volunteers took advantage of the rare opportunity to celebrate National Chemistry Week (NCW) as a part of SERMACS 2007. We organized two mall events that provided hands-on activities and demos and reached out to hundreds of individuals in our community. Thanks to help from our local section and a new initiative by ACS, we could offer materials explaining our activities in both Spanish and English. This new approach was well received and we hope our local section can help us do this again in the future.

We also did an outreach activity at a local elementary school (Stone Academy) here in Greenville, SC. This event occurred on Friday morning (just prior to the start of the undergraduate programming) and involved over 25 volunteers including Student Affiliates and faculty representatives from Newberry, Erskine, Colleges and Clemson Universities and members of the ACS Office of Community Activities (OCA).

The event was a great success. More than 200 students rotated through four different activities. Erskine students shared a great series of demonstrations, students from Newberry and Clemson conducted activities with slime and Oobleck, and ACS staff members helped student participants create coffee filter butterflies. These were only some of the fun activities that participants enjoyed during the two-hour event. A 20th anniversary NCW cake provided by ACS rounded out a great celebration of NCW.

Chemistry in the arts

Once Roald Hoffmann accepted our invitation to speak at the meeting, the theme of "Chemistry in the Arts" seemed a natural choice, as Hoffman had won a Nobel Prize for Chemistry in 1981 and is also a noted poet and author.

To kick off to the undergraduate programming, we organized a symposium entitled, "Advances in Conservation Science." Karen Trentelman from the Getty Conservation Institute provided a great overview of the discipline. Later, Ruth Ann Armitage from Eastern Michigan University presented her research focusing on characterization of organic materials present in samples of rock paintings.

The next speaker, Jennifer Mass from the Winterthur Museum, showed how chemistry can aid in unraveling some of the mysteries in art history. As an example, she provided an in-depth look at the 17th century Flemish painting, *The Armorer's Shop*, which had long been attributed to David Teniers the Younger. Mass provided an overview of confocal x-ray fluorescence microscopy (CXRF) and explained how this technique was used to analyze cross-sections of buried paint layers. The CXRF analysis, in conjunction with additional data, appeared to corroborate the current view that this work of art involved

What Does a Conservation Scientist Do?

"Conservation scientists help conservators understand materials and methods artists used to make works of art and, in some instances, they help determine what is original to the work and what was added in previous restorations. They also develop and test new materials — often from the chemical industry — to help conservators preserve artworks."

— Lois Ember,
Chemical & Engineering News,
July 30, 2001

http://getty.edu/conservation/

a collaborative effort between Teniers and Jan Brueghel the Younger. Together, these three talks provided a great overview of this discipline as an alternative career path, and demonstrated the need for conservation scientists to be versed in multiple complementary analytical techniques.

Roald Hoffmann presented a plenary lecture entitled "Chemistry's Essential Tensions: A Different look at Science", highlighting the strong ties between chemistry and the arts. After describing chemistry as the art, craft and business of substances and their transformations, he discussed the inherent tension between the positive and negative perceptions of our discipline.

Followed the plenary talk, undergraduates attended receptions sponsored by three southeast universities (Emory, Tennessee, and Vanderbilt). There, they mingled with representatives from these graduate programs, fellow students, and conference attendees. Judging from the overflowing crowds at all three receptions, these events were a great success as well.

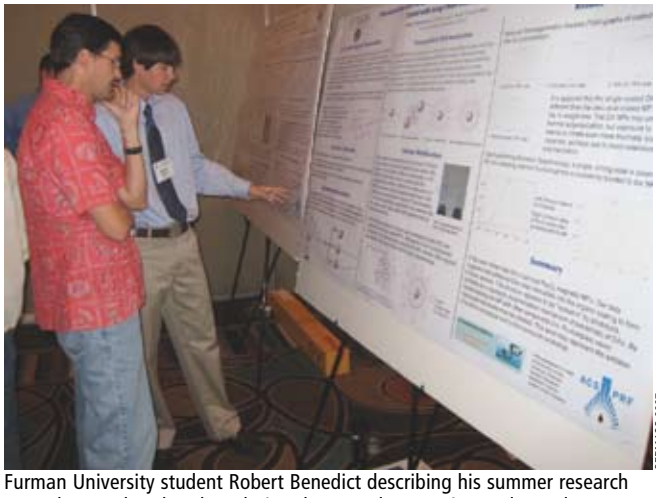
To further strengthen the link between chemistry and art, we prominently displayed winning entries from the "Science as Art" challenge in the lobby and registration areas of the conference hotel. To compete in the competition, scientists had submitted original works that were scientifically significant and artistically appealing. The winning works were real conversation pieces, and we noticed groups of conference attendees enjoying and discussing these works throughout the meeting.

Adding to the excitement of the SERMACS program were the two staged readings of the play, "Oxygen." Written by Carl Djerassi and Roald Hoffman, the play focused on the discovery of oxygen, and also explored the meaning of being a scientist and the importance of the process of discovery in science. Hoffmann participated with the actors, director, and audience members in a discussion after the production. This production was open to the public and we invited local high school teachers and students to attend. Approximately 100 conference attendees and members of the general public attended both productions.

Undergraduate researchers in the spotlight

The ballroom was packed and humming with activity on Saturday morning, with than 170 students presenting their research in two poster sessions and two oral symposia. At the same time, a continental breakfast was served, and more than 20 graduate schools participated in the graduate school fair. The posters and talks spanned the full range of chemistry fields, and an army of judges organized by the Furman University Student Affiliates helped ensure all students had the opportunity to discuss their research. Anyone participating in these events on Saturday certainly came away recognizing the continued strength of undergraduate college research programs in the southeast.

Following the poster and oral symposia, undergraduates were able to unwind at an awards luncheon held at Barley's Taproom in downtown Greenville. In the upstairs room reserved for the event, students relaxed, mingled, and played pool and darts. Appetizers and pizza were provided and awards (including iPods and Barnes and Noble gift certificates) were given to the top three undergraduate poster and oral presentations. While the pizza was somewhat slow in arriving, the students had a great time. This proved to be a great ending to a packed conference.



SERMACS 2007

Furman University student Robert Benedict describing his summer research to Paul Wagenknecht, Ph.D. during the Saturday morning undergraduate poster display.

Chemistry: Seeing the Bigger Picture

Before attending SERMACS, I never realized the widespread and influential impact of the field of chemistry in the world. I'd always thought that our investigations were relevant only to our own research group. It was not until I met two of the most prominent chemists in the field of biophysics at my poster presentation that my view finally changed. I even saw other undergraduate posters displaying research on topics similar to mine. With graduation just around the corner, the experience at SERMACS opened my eyes to a wide range of research possibilities that I might pursue.

I also attended a set of presentations on analytical, environmental, and physical chemistry honoring John Dorsey, Ph.D. A number of his former graduate students and post doctorates had come to this symposium to honor the man who had made a huge impact on their lives and the analytical world. I was able to clearly see the impact that one scientist can have on an entire area of study. I particularly enjoyed this series of talks, since they each had an extra sense of familiarity and humor.

Overall, SERMACS was an amazing experience for me … and I came away thinking that it was an experience that students should have more than once during their undergraduate years. iC

John G. Kaup is the faculty advisor for the Clemson University SAACS chapter. **Megan Fresia** is a senior biochemistry and history major at Furman University.

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