

**Spring/Summer
2004**

Our Trip to Firestone Brewery

Our February outing to the Firestone Walker Brewery in Paso Robles was wonderful. Yes, those of us from the Southland had a ways to go, but the weather was perfect and our hosts were most gracious. For the thirty plus who attended, it was very informative, as well as a great time.

Matt Brynildson, the brewmaster, was full of information. So much so, that if I could remember it all, it would be a book. He knew a lot of beer trivia and he could tell you how almost any beer on the market was made. Additionally, as you may have noted in the flier, Matt has a degree in chemistry, which preceded his education in brewing. With this background, he was able to explain the chemistry that is behind the beer making process.

Before we began the tour of the plant, Matt introduced us to the ingredients that are used to make the beer. Have you ever wondered if beer really is better in the Old Country? Well, Matt let us know that many of the premium varieties of barley and hops are grown there, and that is their secret. To keep with the Old World tradition, Firestone imports many of their ingredients from the other side of the "Pond." It is more expensive, but for the beer *connoisseur*, it is well worth the few extra dollars.

As Matt spoke, he passed around a few samples of the ingredients to see, smell, and taste.

We started with the barley. The pale beers are made from kiln dried barley to make a "pale malt." Low temperatures are used to keep the proteins from denaturing. This pale grain was actually quite tasty. Darker malts are made by using higher temperatures. The denatured proteins in these darker, caramelized malts imparted a bitter taste much like coffee. I'm not a coffee drinker, and I didn't find them all that palatable.

Next he passed around two varieties of hops, one that was American grown and one that was imported from Europe. Hops are flowers that grow on vines. They are green and look a bit like a pine cone -- there were a few dried samples hanging around the lobby. In the form used for brewing they are ground up and smashed into pellets that

looked something like gerbil food. The American variety smelled a bit like lemons and grass, while the European variety had a more herbal aroma.

The final ingredient we sampled was some thick, foamy yeast. He said you could taste it, but I took a pass.

We used the finished product to help us wash down some pizza before heading off to the brewing facility. By the way, if you want information on their beers, they have a great website (www.firestonewalker.com) that is filled with information: beer description, ingredients, alcohol content, color, and more.

When first entering the plant, you might think you were at a winery, and although it is similar in many ways, there are a few important differences.



It's in the barley

To start with you are using grain, not fruit. The malted barley is gently crushed in a way that only cracks the hulls. Matt forewarned us that it was

important not to shred the hulls. The malt is then added to a tank of hot water where the starch is digested by the grains' own enzymes into simple sugars. During this process the liquid (wort) is drained out the bottom and recirculated into the top of the container. This process continues until a simple iodine test indicates there is no remaining starch. Once the starch is digested the hulls settle to the bottom of the container, which has a wire mesh. Here the hulls actually act as the filtering material. At this point the wort is heated to 168°F to denature the enzymes. This also kills any of the yeast or other microorganisms that may have made their way into the mix. Finally, the wort is recirculated until the liquid is visibly clear (meaning all the insoluble proteins are filtered out).

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Upcoming Events

- Amgen Tour in Thousand Oaks August 6. Space is limited.
- The 228th ACS National Meeting August 22-26, Philadelphia, PA
- National Chemistry Week October 17-23
- Fall Meeting TBA
- Western Regional ACS Meeting, October 27-30, Sacramento, CA
- Holiday Wine Tasting Meeting

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Two hydrogen atoms are walking down the street. One hydrogen atom says to the other, "I think I have lost my electron." The other hydrogen atom says, "Are you positive?"

Author unknown



Firestone Brewery

(Continued from page 1)

Now the wort (sugar water) is ready for all the added ingredients such as phosphoric acid (to adjust pH) and hops. There is one more heat cycle to kill off any unwanted microbes and to isomerize the hops' alpha acids into iso acids. The iso acids are more soluble, and they impart the bitter taste to the beer. Now wort is ready for the fermenting tank.

Depending on the type of beer, this tank might be stainless steel or oak barrels. The barrels add additional flavor as they do to wine, and Firestone only uses their barrels for a short period of time to ensure maximum flavor. Matt told us that some large commercial brewers add oak chips to get a similar effect.

The yeast is added to the fermentation tank. During this first fermentation cycle the mix is exposed to oxygen. It is then transferred to an airtight fermentation tank for a second fermentation. This consumes the remaining oxygen to prevent spoilage later. From now on the beer must not be exposed to oxygen. The beer also must be handled carefully so it

does not foam -- it is said that beer will only foam once. The foam, like sea foam, is due to protein in the solution.

During packing, the bottles are evacuated and filled with carbon dioxide two times. The beer is injected, and a shot of hot water is added to cause carbon dioxide to be released, which acts as a blanket to prevent oxygen from getting in during capping. Homebrewers and some commercial brewers add a little sugar and some yeast to consume any adventitious oxygen. Firestone does not do this, and Matt suggested not storing beer for a long time, so drink up.

One little extra that doesn't have much to do with the beer, is what happens to the spent grain and extra yeast -- during this process the yeast multiplies to give you four times as much as you had when you started. Matt told us that there are some lucky cows who feast on the hulls and slurp the yeast suds. Being someone who grew up on a farm where we fed our beef cattle grain to fatten them up for slaughter, this sounds like the making of some tender steaks. My apologies to the vegetarians out there.

Story by Curtis Musser



Tasting and Talking



Matt Brynildson addressing the group

Photos by David Marten

Riddle Me This...

WHY DOES A CAN OF SODA REMEMBER THAT IT HAS BEEN DROPPED?

We've all had the experience that if we shake or drop a can of soda (or pop, for some of us between the coasts), the soda will spurt out and bubble over unless a minute or two passes before the opener is cracked. Some people also say that it's necessary to tap the top of the can to avoid the same result. The question is, how can we make chemical sense out of these observations?

One might claim that when soda is bottled, this closed system is at equilibrium (i.e. the CO_2 pressure in the headspace has the same chemical potential as the H_2CO_3 dissolved in the water). Only when the can or bottle is opened does CO_2 escape from headspace, lowering the pressure and chemical potential of the CO_2 in the headspace and creating a non-equilibrium situation. CO_2 then slowly

evolves from the drink until $[\text{H}_2\text{CO}_3]$ approaches equilibrium with CO_2 at atmospheric pressure.

No one would dispute that shaking an open can of soda makes it fizz faster, presumably by causing more shock induced CO_2 micro-bubble nucleation sites, and allowing the system to reach equilibrium faster (even more spectacular is sonicating a freshly opened bottle of soda). But why does jarring the soda affect what is supposedly a system at equilibrium, before the top is off? And why does it take a few minutes (or some judicious can tapping) for the can to 'forget' that it has been dropped?

If you believe you have the answer to this tremendously important question, please drop us a line at calpacs@chem.ucsb.edu, and we'll print your answer in the next newsletter, space allowing.

Contributed by Ivan Lorkovic

Something Else to Ponder!

"Why does wet metal (e.g. exposed iron plumbing) have a characteristic smell? What chemistry is responsible for that smell?"
(No answers involving "vibrational frequency" allowed!)

2004 Executive Board Members



Pictured (l to r): *Back Row:* Robert Neuman, Albert Censullo, Curtis Musser, Kathy Jimison, Ivan Lorkovic, David Marten, Bruce Rickborn, Henry Alegria, Ata Shirazi, James Pavlovich, *Front Row:* Jerry Skarnulis, Dieter Klaubert, Allan Nishimura

Photo by Tyrena Chin

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National Chemistry Week Fun Filled Opportunities are Available

All individuals dedicated to enhancing the public's awareness of chemistry are invited to sign up to help organize local observances of National Chemistry Week-2004 (October 17-23). The 2004 theme is "Health and Wellness!" The annual NCW celebration unites ACS local sections, industries, schools, and individuals in communicating the importance of chemistry to the quality of life.

Volunteers are needed for the following NCW assignments:

Event Coordinator
Volunteer recruiter
Activities coordinator
Industrial interaction coordinator
Safety officer
Refreshments coordinator
Financial advisor
Publicity coordinator (could be designated Public Relations chair)

If you are interested in volunteering for any of these positions, please call Kathy Jimison at (805)

546-3100 x2730.

For more information about National Chemistry Week, please visit the NCW website at chemistry.org/ncw or if you will be attending the 228th ACS National Meeting in Philadelphia, PA, visit the Office of Community Activities Exposition located at booth #1016 at the Philadelphia Convention Center, Monday and Tuesday, August 23 and 24, from 9AM-5PM and Wednesday, August 25, from 9 AM-1 PM.

US Chemistry Olympiad

The Chemistry Olympiad begins at the local sectional exams of which there are two, the Local Section Exam and the National Exams. From there, the best are chosen to attend the US National Chemistry Camp in Colorado Springs. The best of that group represents the United States in the 36th International Chemistry Olympiad, which will be held in Kiel, Germany this year in mid July. This year approximately 100 students from Arroyo Grande High, Cate, Santa Barbara High, Mission College Preparatory, Santa Maria

High, and Righetti High School participated in the Local Section Exam. Based on the local section membership, we are allowed 8 students to participate in the National Exams. Out of the group that took the Local Section Exams, the following students were invited and took the National Exam that was held at Westmont College in April: Brooke Baker and Sam Wilson, Mission College Preparatory, San Luis Obispo, chemistry teacher: Peggy Randall; Rusty Barker, Cate School, chemistry teacher:

Curtis Musser; Danny Silverman and Erick Bank, Santa Barbara High School, chemistry teacher: Susan Park. They all did an excellent job!

We are looking forward to next year's Chemistry Olympiad. Please encourage high school chemistry teachers who you know to participate in this great event!

Story by Allan Nishimura

Employment and Equipment Websites

www.CaliforniaCoasthelpwanted.com
www.cen_chemjobs.org
www.chemistryjobs.com
www.chejobs.com
www.chemsoc.org/careers.careers.htm
www.jobspectrum.org
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www.GenTechScientific.com
www.labequip.com
www.overbrookscientific.com
www.GoToSam.com

For the Art Lover Who Is Also a Scientist

On Tuesday, May 18, the Getty Conservation Institute (GCI) hosted CALPACS members, their spouses, and their students - nineteen in all - for a day at the Getty Center. After arriving at the Center I took off to the Photographers of Genius exhibit. It was an added treat. Some of the earliest photographs to be made were on display as well as narratives about technology and people behind them. These early photographers were also chemists and engineers, and although their methods were simple by today's standards, the quality of their work was quite impressive.

After a quick bite to eat we were off to the GCI. Cecily Grzywacz (CGrzywacz@getty.edu), one of the GCI chemists, gave us a general overview of the type of work they do. As Cecily explained it, conservation science, in the context of the arts, uses the theoretical and applied disciplines of science and engineering to gain a greater understanding of how best to preserve cultural resources over the long term. The ultimate objective of the research is the development of conservation approaches that can slow the deterioration of materials and, at the same time, prevent further damage. The GCI also conducts scientific research on materials' composition - and on the original technologies used to create works that can contribute to the scholarly interpretation of art and artifacts from the past. In addition, the Institute engages in specialized work in support of the activities of the Getty Museum that includes the dating and analysis of materials, authentication, and identification.

Some of the work is done at the Getty Center, but much of it is done in the field. Cecily showed us a series of pictures of field projects that involved GCI scientists. They included photographs depicting the preservation of the Mogao grottoes. These grottoes are located in caves near the ancient town of Dunhuang in northwestern China. The grottoes contain the largest body of Buddhist art from the fourth to the fourteenth centuries in the wall paintings of some 490 cave temples cut into a mile-long cliff. Cave 85, with sixteen large illustrated sutras in the main chamber, was completed in the year 866 as a commission of the Zhai family of the Dunhuang region. Deterioration of the paintings stems from environmental conditions at

the site, flooding, and earthquakes, as well as the original painting materials and techniques. While some of these problems may never be completely eliminated, understanding the causes and processes - in particular the role of water and soluble salts - is the basis for developing conservation measures to reduce the rate of deterioration and ameliorate the situation.

A second field project Cecily discussed with us involves earthen structural remains at the World Heritage Site of Joya de Ceren in El Salvador. These remains were buried by a volcanic eruption in the 6th century. The GCI has been working with cultural authorities in El Salvador to create a management plan for the site. Scientific research and condition monitoring have also been conducted to better understand deterioration at the site and to develop plans for conservation treatment.

Next, Vincent Beltran, Assistant Scientist, spoke to the group about many areas of research he is currently involved in. One project focuses on the development of economical and sustainable strategies that significantly reduce biodeterioration by improving the physical environment of collections housed in historic buildings in hot and humid regions. Specifically, he researches alternatives to conventional air conditioning systems by studying the control of relative humidity through ventilation and heating, while allowing larger variations of temperature. The project's primary objectives are: to define and test strategies that arrest microbial activ-

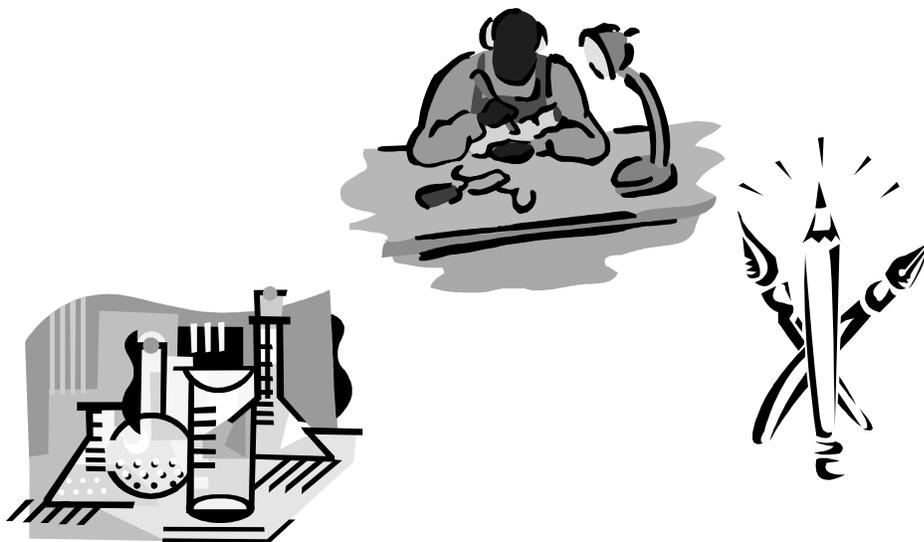
ity through the environmental control of cultural institutions housed in historic buildings; to install, operate, and evaluate several climate control systems consisting of ventilators and heaters that are humidistat-controlled; to disseminate information generated by this project through publications and workshops.

David Carson, Assistant Scientist, then spoke to the group about his work with an analytical instrument known as the scanning electron microscope. The GCI's environmental scanning electron microscope (ESEM) is used to analyze samples from painted tomb facades in Petra, Jordan, and other sites. In combination with optical microscopy, the ESEM, a powerful tool for identifying the composition of micro-samples, provides GCI scientists such as David with fast and reliable answers to technological questions of paint materials. It also assists in addressing issues like authenticity.

At the conclusion of our visit, it was wonderful to have the bus driver face the LA rush hour on the way home, leaving us free to relax and discuss our day with each other.

If there is a place that you would like us to visit, let us know. We are always looking for new ideas and places that would be of interest to our members.

Story by Karen Musser



VIEW FROM THE BOARD

-Stanley Pine ACS Director – District VI

Continuing my goal of communicating with the members, I want to bring you up to date on some of the ACS activities. I will try to keep you informed and ask that you do the same for me. You may also want to look at my web site, www.stanleypine.org.

American Institute of Chemical Engineers – You are probably aware that the ACS has begun talks with the American Institute of Chemical Engineers (AIChE) with the goal of cooperating on programs and activities of mutual interest. The “official” discussions, being carried out by a small committee appointed by the Board, are focusing on a number of cooperative programs and activities in areas which will serve the needs of the members of both organizations as well as the chemical enterprise while enhancing each groups ability to achieve their missions.

Programming is an area of initial interest and several technical sessions were jointly sponsored at the Anaheim meeting. Many of the issues related to such cooperation were considered by many committees and other groups at the national meeting and about an hour was devoted to an open discussion of these issues at the council meeting.

William Byers, president of AIChE and John Sofranko, executive officer, stressed the ways in which working together will strengthen the value that both organizations bring to their members and the industries they serve. “In this era of rapid innovation and globalization, we can accomplish so much more by working together to advance science

and technology, enhance the careers of scientists and engineers, and provide benefits to society.”

I expect that you will be reading more about this in C&EN. In June, the ACS Board will again consider the broad and long term implications of such alliances.

High School Chemistry Teacher Membership – A bylaw change that will identify the requirements for membership for pre-college teachers in the chemical sciences was introduced for consideration at Anaheim. The goal, which I have been promoting for several years, is to make these teachers feel welcomed into our professional society. They are the ones responsible for providing high quality education for our children and we need to do everything possible to support and help them in those efforts. If passed by the council at the fall meeting in Philadelphia, you will get the opportunity to vote for the change in the late Fall.

Strategic Plan – A new ACS strategic plan was adopted as of the beginning of this year. The Strategic Plan is the guide for short and long term activities of the ACS, including financial management. Our objective was to be inclusive with the charter of the ACS that describes us an educational and scientific professional organization. Within that context, the Strategic Plan was designed to provide broad flexibility in achieving our goals while not being prescriptive in how that would be accomplished. It is up to the membership, through the ACS sections, divisions, and committee structure, to provide specific actions for the society. We invite your participation in making this plan work effectively for the membership.

Regional Meetings – I want to remind you that there will be two regional meetings held this year in our District VI. In June, the Northwest Regional Meeting will be held in Logan, Utah, jointly with the Rocky Mountain Regional Meeting. In October, the Western Regional Meeting will be held in Sacramento. Check the ACS web site for more information, but do plan to attend at least one of these meetings.

Chemistry Textbook – The ACS Education Division has just published a new textbook, “Chemistry”, designed for college freshman in chemistry and other sciences and engineering. It is another in the series of education projects which have proven very successful in changing and refocusing the direction of chemistry education at the pre-college and college levels. If you have any connection to the teaching of freshman chemistry, I urge you to look at the text (published by W. H. Freeman).

Beckman pH Meter Historic Chemical Landmark – On March 24th, the Southern California and Orange County Sections hosted a recognition ceremony at Caltech for the development of the Beckman pH meter. I encourage other local sections in our district to consider sites or activities that would warrant such recognition. It is an important and rewarding activity and brings the successes and impact of chemistry to the public.

Executive Director – Our new Executive Director, Madeleine Jacobs, has been on the job for three months. She is making a significant impact through some high level reorganization and in particular through her enthusiastic and positive spirit. We are very excited and pleased with her leadership.



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**Amgen Tour by July 23. Watch for
the flyers!**