

THE VORTEX

AMERICAN CHEMICAL SOCIETY
VOLUME LXXIV NUMBER 8

CALIFORNIA SECTION
OCTOBER 2013



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Published monthly except July & August by the California Section, American Chemical Society. Opinions expressed by the editors or contributors to THE VORTEX do not necessarily reflect the official position of the Section. The publisher reserves the right to reject copy submitted. Subscription included in \$13 annual dues payment. Nonmember subscription \$15.

MAGAZINE OF THE CALIFORNIA SECTION, AMERICAN CHEMICAL SOCIETY

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Quantity Postcards
255 4th Street #101 Oakland CA 94607 510-268-9933
Printed in USA on recycled paper

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Chair's Message

Wally Yokoyama

It is Fall and the natural world busily prepares for Winter, a period of dormancy. However, CALACS knows no period of dormancy.

At the end of August we participated in the award ceremony for the ACS Historic Chemical Landmark award recognizing the pioneering work on flavor chemistry and the development of early versions of the gas chromatograph and GC/MS. This took place at the USDA, Western Regional Research Center, Albany, CA on August 29, 2013. The ACS President, Dr. Marinda Wu, made the presentation. Dr. Wu as most of you know is also a CalACS local section member. There were also representatives from ACS national in Washington as well as representatives from the U.S. Senate, U.S. Congress, Albany Mayor, CA Dept of Food and Agriculture, and USDA. This is the second Historic Chemical Landmark award for the Albany Lab. It was a particularly historic award because this was the first and only time a second Historic Chemical Landmark award has been presented to the same institution.

By the time the newsletter is delivered WRM2013, regional meeting at the Hyatt Regency, Santa Clara, Oct 3-5, hosted by our local section and the Santa Clara

Valley section would have taken place. Regional meetings provide an opportunity for chemists who are not able to attend national meetings a chance to present their research and meet their peers. Regional meetings take years to plan and organize. Dr. Lee Latimer and Neal Byington were the organizers and drivers for Cal local section. We appreciate their time and effort to organize WRM2013.

The section also had a well attended booth at the Solano Stroll, Sunday, September 8. It was a beautiful day. Kids as well as adults participated in hands-on chemistry projects that you can read about elsewhere in the Vortex. Thanks to Dr. Margareta Sequin, SFSU, for organizing and coordinating the booth activities.

Don't forget National Chemistry Week Oct 20-26. This year the NCW activity will be a Family Science Night at Thornton Middle School in Fremont on Wednesday, October 23rd. Thanks again to Dr. Alex Madonik who has organized and coordinated this event for over ten years. And don't forget Mole Day (10-23).

Happy Halloween.



*California Section ACS
October Section Meeting
First in a series – Innovative Companies in the Bay Area*

Topic: Amyris: Changing the Way Stuff is Made

Speaker: Sara P. Gaucher, Ph.D. Associate Director, Screening and Analytics

Date: Wednesday, October 16, 2013

Time: 6:00- pm Social Hour, 6:30 pm Dinner; 7:30 Talk

Place: Pyramid Alehouse, Walnut Creek, 1410 Locust Street

Parking: Parking on street (meter in effect till 6:00pm) or various pay lots in area.

Cost: \$28.00 (students \$14.00) Buffet Style dinner will be served which includes, Mixed Green Salad, Sautéed Seasonal Vegetables, Roasted Red Mashed Potatoes & Gravy, Roasted Grilled Chicken, Apricot Ale Glazed Salmon, Pumpkin Ravioli with Sage Cream Sauce.

Reservations: RSVP no later than Tuesday, October 8th, to the Section office by e-mail at office@calacs.org or call (510) 351-9922. To prepay, please send check to Cal. Section, ACS at 2950 Merced Street, #225, San Leandro CA 94577 no later than Wednesday, October 9, 2013.

*(PLEASE note the date has change as
advertised in the September Vortex from
October 10 to October 16, 2013)*

Abstract

Many of the items we use every day have been manufactured using chemical building blocks originating from petroleum, a non-renewable resource. Others are obtained from unsustainable sources or sources plagued by unreliable supply. There is a desire by many companies to change and to base their products on renewable, sustainable feedstock chemicals, available in steady supply. More and more consumers desire sustainably sourced products, but the quality must be as good as the products they are used to. Amyris meets the needs of both supplier and consumer by using the power of synthetic biology to change the way “stuff” is made. The Amyris platform is a marriage of biology and chemistry that grants access to over 50,000 useful products and building blocks. This talk will describe our approach from yeast strain creation and testing, to scale up of the fermentation process, to the chemical finishing that creates the final

product. The story will be told through the lens of the analytical technologies required to make it happen.

Biography

Dr. Sara P. Gaucher is currently the Associate Director of Screening and Analytics at Amyris where she has worked for the past 6 years. Her team is responsible for assay development and product stability studies to support process testing and manufacturing. Previous roles at Amyris include leadership of the BioAnalytics group, responsible for strain analysis using ‘omics (measurements of RNA, proteins and metabolites) and physiological assays. She has thus been directly involved in the entire pipeline from strain to final product. Dr. Gaucher received her B.S. in chemistry from MIT and her Ph.D. from U.C. Berkeley, where she worked in the lab of Dr. Julie Leary in the field of biological mass spectrometry.



CalACS at the Solano Stroll in Berkeley, September 8, 2013

A sunny day with perfect temperatures attracted crowds of people to this year's Solano Stroll and to our CalACS booth at the top of Solano Avenue. Section chair Dr. Wally Yokoyama and Dr. Chris Silva, aided by Charlie Glukowski and Dr. Carlo Séquin, set up our booth in the early morning, while Jerry Oliveras and son Paul deftly did the electrical connections with 50' of extension cords. In the meantime, Dr. Diana Cedeno and Dr. Margareta Séquin set up colorful displays with flasks containing cabbage extract solutions, containers of red radishes, deep-red dahlias and other purple and blue flowers for the hands-on demos to come. ACS banners and posters decorated the booth.

At the start of the event at 10 am, shortly before the parade got in motion, our CalACS booth was attractively set up, complete with "Celebrate Chemistry" brochures and information materials on Project SEED, Family Science Night, and posters on ChemLuminary Awards and the USDA Historic Landmark dedication.

The major attraction was our colorful hands-on demo where children and adults had fun making rubbings of the purple to red anthocyanin pigments onto paper strips and then adding drops of vinegar or baking soda solution with pipets. The observed color changes led to chats about pigments in plants, in plant foods, as indicators and about more plant chemistry. The hands-on activity proved to be a great draw, and children and adults alike tried their hand at making attractive "bookmarks".

Doing the experiments with the consistent flow of people and providing the necessary explanations was only possible with the help of a good number of dedicated volunteers: Dr. Diana Cedeno, Charlie Glukowski, Jerry Oliveras, SFSU chemistry students Kristen Decker, Domanick Contreras and Cesar Morfin, followed by Nicki Davis, Jeanne Killian, UCB student Ruth Kim, Dr. Eileen Nottoli, Kathy Shepler, and supported by Dr. Margareta Séquin. We were able to interact with very diverse audiences, including young children, teenagers, young athletes, parents, and grandparents who wanted to do our activities and talk with us. It was a rewarding experience for the volunteers, too, who commented that it was a lot of fun to participate and that we seemed to do our part to advance the image of chemistry with the public.

At the conclusion of the event, booth volunteers were very glad about the great public interest we had generated, but exhausted as well. Therefore it was highly appreciated to have Drs. Chris Silva and Carlo Séquin most efficiently dismantle all the equipment and clean up our site.

Margareta Séquin



Some of our volunteers at the Solano Stroll : Diana Cedeno, Nicki Davis, Domanick Contreras, Kristen Decker



The Background on Background

Bill Motzer

Introduction

We frequently read in the press and popular literature that chemical pollutants have been detected in the environment (e.g., air, soil, surface water and groundwater) above “background” concentrations, thereby posing a “risk” to all exposed to such concentrations. However, what is not discussed is what actually is meant by the term “background.” Although the following discussion focuses on elemental and inorganic compound complexes (with chromium as an example), similar reasoning can be made for naturally-occurring organic substances.

Efforts have been made to define what is meant by the terms “natural”, “normal” and “background” and why such distinctions are important. According to Jack Fergusson of the University of Canterbury, New Zealand: “An important reason for knowing the natural concentrations of the heavy elements, is that they provide a true reference point for estimating the extent of pollution from the elements. This is of particular importance when assessing the toxic effects of the elements. Natural levels allow contemporary levels to be seen in perspective, i.e., whether they are excessive or not”.

Element concentrations currently found in the biosphere are often called “normal” which may be misinterpreted for “natural.” The term “typical” is more applicable to contemporary trace element concentrations. As for “natural” element concentrations, distinctions must be made between:

(1) Ancient concentrations as determined in prehistoric human remains such as bone, teeth, hair recovered from skeletal and mummified remains. True pre-human background concentrations in natural materials may also be found in deep ice, sediment, and peat cores, and in deep ocean waters as opposed to surface sea water which has been contaminated by

human inputs (e.g., streams, rivers, and the atmosphere).

(2) Remote places include the Arctic, Antarctic, Greenland, mid-ocean water, and in mountainous or alpine areas such as the Himalaya Mountains of Tibet. These areas have had less human impact, although with increasing atmospheric pollution even remote areas can be significantly affected.

(3) Mineralized areas where element concentrations are higher than surrounding region. Such element concentrations often surround known ore deposits or areas having undergone element enrichment from hydrothermal (hot spring) activity. The difference in mineralized areas from “natural” background is often called “threshold concentrations.” The determination of natural background or threshold concentrations of metals in surface water in mineralized areas has become a significant problem because many formerly mined areas have been designated as Superfund sites from metals contamination produced by waste rock dumps and tailings at mines and smelter sites. Therefore, understanding background concentrations derived from mineralized areas becomes important in distinguishing natural threshold background concentrations from mined areas.

(4) Rural settings are those areas away from urban environments. However, some rural areas such as farms may have element concentrations that have been influenced by the use of fertilizers and pesticides.

(5) Urban areas such as those within cities generally have element concentrations higher than natural background. This is particularly true for surface soils in parks, greenbelts, and alongside roads and highways that are impacted by vehicles using and burning petroleum products and fuels (lubricating oil, gasoline, and diesel).

(6) Industrial areas and zones, where element concentrations may be considerably above those found in the other settings but still below regulatory agency levels that might be considered toxic to humans.

One example is chromium (Cr) (atomic number 24), a transition metal occurring in Group VIB of the periodic table. In

(Continued on page 9)

USDA., Western Regional Research Center, Albany, CA receives a 2nd ACS Historic Chemical Landmark Award

ACS President Marinda Wu presented the ACS Historic Chemical Landmark Award to the USDA, Western Regional Research Center on Thursday, August 30, 2013 at the Albany laboratory. The award includes a large brass plaque describing the chemistry of isolating and identifying flavor molecules in the 1950s and 60s. Early models of gas chromatographs and the combination of gas chromatography and mass spectrometry were also developed at the lab. The Western Regional Research Center is the only laboratory to receive two ACS Historic Chemical Landmark awards. Attending the awards ceremony (left to right) Alex Madonik, Janan Hayes (Sacramento section), Brian Balaz, Attila Pavlath, Wally Yokoyama, Marinda Wu, Mark Frishberg, and Elaine Yamaguchi. Also present were Lee Latimer, Bonnie Charpentier, Michael Cheng.



Deje Vu

Lower picture: Land Mark Award USDA, 2002, the first time, Attila Pavlath ACS President, Marinda Wu California Section Chair.

Upper Picture, Land Mark Award USDA 2013, the second time, Marinda Wu, ACS President, Wally Yokoyama, California Section Chair..



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Fun With Food Event



Thanks to Alex Madonik for this photo and the one on page 9 taken in San Leandro at the Library's Fun With Food event on July 2013. Here is Alex making ice cream for a group of very interested kids

(Continued from page 6)

the environment, Cr commonly occurs in two oxidation states: (1) Cr(III) occurs as insoluble chromium oxide (Cr_2O_3) and chromium hydroxide [$\text{Cr}(\text{OH})_3$] and as soluble chromium hydroxide cations: CrOH^{2+} and $\text{Cr}(\text{OH})_2^+$; (2) Cr(VI) generally occurs as soluble dichromate ($\text{Cr}_2\text{O}_7^{2-}$) and chromate (CrO_4^{2-}) anions. Cr(VI) compounds are important because they are known human carcinogens when inhaled and suspected carcinogens when ingested. Cr(VI) (aka “hexavalent chromium” – see the October 2007 Vortex: “Valencing Oxidation States”) gained public prominence from the movie Erin Brockovich about Cr(VI) contamination to groundwater in Hinkley, California. On August 23, 2013, the California Department of Public Health (CDPH) proposed a drinking water maximum contaminant level (MCL) of 10 $\mu\text{g}/\text{L}$ for Cr(VI).

As with other elements in the periodic table, Cr concentrations in natural substances are quite variable. Cr preferentially concentrates in various rocks throughout the Earth’s crust with concentrations dependent on the rock’s origin and source (known as geogenic sources). Cr concentrations in crustal rocks range from 20 mg/kg in felsic igneous rocks such as granites to more than 2,000 mg/kg in ultramafic igneous rocks (and their metamorphosed equivalents). The crustal average for Cr is reported at approximately 100 mg/kg. Cr concentrations are also

quite variable in secondary geochemical environments, such as soils, sediments, streams, lakes, and groundwater. Therefore, Cr(VI) background concentrations in California’s surface water and groundwater may be quite variable depending on the different geologic sources.

The CDPH maintains a Cr(VI) data base for production and monitoring wells sampled and analyzed from 2000 to 2011 for Cr(VI) in groundwater: 65% of their detections have Cr(VI) concentrations ranging from 1 to 5 $\mu\text{g}/\text{L}$ and 86% ranging from 1 to 10 $\mu\text{g}/\text{L}$. Most likely Cr(VI) concentrations that are $\leq 10 \mu\text{g}/\text{L}$ represent natural Cr(VI) background concentrations. Cr(VI) may occur naturally in groundwater throughout California because of sources of naturally-occurring Cr in source rocks and oxidizing and alkaline geochemical environments favoring Cr(VI) formation over Cr(III) which commonly forms in more reducing and acid environments. Concentrations may also significantly vary because of anthropogenic influences and inputs, largely from smelting of Cr ore and burning of fossil fuels such as coal and petroleum. Therefore, it may be difficult to distinguish natural or geogenic background concentrations from anthropogenic sources when using standard U.S. EPA analytical methods. However, using nonstandard methods may distinguish anthropogenic sources from geogenic sources; this will be the focus of future articles.

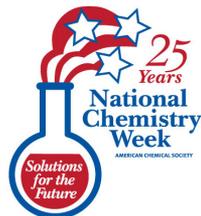


Eileen and Paul having “Fun With Food” along with all the kids at the San Leandro Public Library in July 2013

Celebrate National Chemistry Week 2013 – October 20th to 26th

NCW is the leading ACS outreach program.

Originally conceived by UC Berkeley Professor George Pimentel, who, as ACS President, launched the first celebration in 1987, it's our chance to tell the public how chemistry has improved our lives. We can also spark the curiosity that will encourage kids to study science.



Our signature NCW event is Family Science Night.

ACS President Marinda Li Wu organized our first FSN in 1997, and we've continue this tradition ever since. We're looking forward to another great evening of celebrating chemistry when Thornton Junior High School in Fremont hosts Family Math & Science Night on Wednesday, October 23rd, 2013, 6:30 to 8:30 PM. Even if you've never participated before, consider joining our volunteer team for a memorable evening of entertainment and hands-on fun. The Scientific Jam Band will open the show, which will also include some spectacular demonstrations by Bryan Balazs. The Thornton staff is eager to help us fill the gym and a dozen classrooms with demonstrations and hands-on activities, so this could be one of our biggest and best events ever. Whether you have an idea for an activity, or just want to help out at one of the stations, we would love to hear from you.

This year's NCW theme is, "Energy – Now and Forever!"

The ACS sponsors an NCW Illustrated Poem contest for K – 12 students.

Illustrations must be hand-drawn, and the poem should pertain to the NCW theme. Entries must be received at the California Section office no later than Friday, October 25th, 2013. The Section will award prizes for the best entries in the following categories: grades K – 2, 3 – 5, 6 – 8, 9 – 12, and the winning entries will compete in the national contest for cash prizes. Help us make this contest a success by encouraging your local teachers or school to participate. Please contact the California Section office for complete details, including the required entry form.

Are you looking for resources to celebrate National Chemistry Week?

The California Section can supply NCW stickers, temporary tattoos, and other souvenirs, as well as copies of the Celebrating Chemistry publication, with a variety of articles and activities aimed at younger students. This publication and many other resources can also be found on-line at <www.acs.org/ncw>.

Alex Madonik, NCW Coordinator
California Section, ACS

510-872-0528 mobile
<madonika@comcast.net>

Save The date

November Section Meeting - Joint Meeting with the Santa Clara Valley Local Section

Date: Thursday, November 14, 2013

Place: Basque Cultural Center, South San Francisco

Cost for dinner: \$28

Topic: Popular Science Writing and Publication (exact title to be announced).

Speakers: Peter Aldhous of New Scientist and Nadia Drake of Wired on-line magazine
Menu choices, directions, speaker bios and abstract to follow.

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