

# THE VORTEX

AMERICAN CHEMICAL SOCIETY  
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CALIFORNIA SECTION  
JUNE 2014



Awards Luncheon. Left to right: Evaldo Kothny, Elton Cairns, Dean Coons, Alex Mihailovsky, Kenneth Rice, Marinda Wu, Kenneth Osborn, Sheldon Schaffer, Wallace Yokoyama, Michael Ansell, Henry Lew, Roger Phillips, and Leonard Gray

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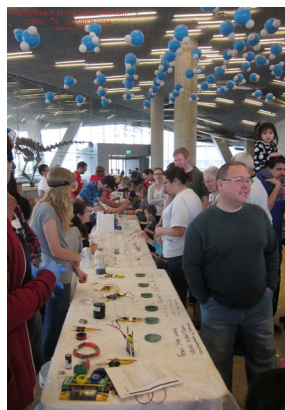
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# THE VORTEX

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### *Chair's Message* Mark Frishberg

I want to remind everyone about the upcoming events to look forward to for the rest of the year.

For the third time in my monthly messages this year I want to make sure that no one forgets the ACS National Meeting coming up in San Francisco on August 10-14, 2014. Also, please save the date of Saturday, August 9<sup>th</sup> from at least 10am until 2 pm as the location of our public outreach event has finally been confirmed – at the Children's Science Museum - just across Howard Street from the Moscone Convention Center North, and right behind the large carousel. Please check the announcement on page 2 of this issue. This will be a joint activity between the National ACS Committee on Community Affairs (CCA) and both our California Local Section and the Santa Clara Valley Local Section. Make sure you check the calacs.org website over the next few months for the latest news of events being planned – and consider volunteering to help with the hands-on demonstrations, speak with students and teachers, or simply help with crowd control at the outreach event, or at our hospitality booth in the Convention Center from Saturday afternoon through Thursday.

Another event under development for the

National Meeting, functionally named the "Bay Area Chemistry Hall of Fame" will be a collection of posters highlighting the contributions to society of renowned local chemists and their Bay area companies, government agencies, and academe. The location(s) of this event is expected to be in the Hilton Hotel Union Square, and some of the posters may also be displayed around our Hospitality Booth in the Convention Center. Again, check our website for final times and locations which will be posted when available.

Before I leave the subject of the National meeting, I want to draw your attention to three other items. First, CALACS has just been notified that we have been named a finalist for seven Chemluminary Awards for outstanding programs in 2013. The awards will be presented at a gala affair at 9 pm on Tuesday, August 12<sup>th</sup>, preceded by a poster session. Please join other local section members at this event to enjoy the festivities and cheer for any awards that we win. Check the meeting program, when available, for the hotel location of this event. Second, make sure to check the Division of History program for a symposium honoring the career of our very own ACS Past President, Attila Pavlath. Finally, for our student members looking ahead to jobs following college, and our members who find themselves in career transitions, make sure that you take advantage of the ACS

*(continued on page 8)*

## *Earth Day Celebration at John Muir National Historic Site, Martinez, April 26, 2014*

Once again, members of the California Section of the ACS set up a booth for the full day celebration of Earth Day in Martinez, CA. This annual festival at the John Muir National Historic Site brought together representatives of 54 groups to engage the public in celebrating Earth Day and John Muir's birthday. This was the Centennial Celebration of John Muir's legacy with the keynote talk by Bruce Hamilton, Deputy Executive Director of the Sierra Club. The event also included a recycled fashion show, and a talk about the cloning of Muir's famous sequoia. The event featured booths on environmental issues and included eco-friendly exhibits, several speakers, live music, and presentation of the John Muir Conservation Awards recognizing the work of several groups and individuals. The event drew over 2000 people.

Our booth focused on the theme, "The Wonders of Water" with hands-on activities developed by the ACS Committee on Community Activities (CCA) as part of its Chemists Celebrate Earth Day (CCED) Program, and on Smells of Plants and Molecule Building, as this activity was a big hit with both children and adults at our last event. The plant smells and molecule building presentation was set up by Dr. Margareta Séquin, and the water-themed activities by Drs. Anne Frazer and Sheila Kanodia. We also displayed banners, a periodic table, T-shirts with chemical structures, Earth Day balloons, many posters (wetlands and green chemistry posters, and a fold-out spread on aquifers from the Earth Day brochure), and we handed out the Celebrating Chemistry Earth Day brochure (in English and Spanish) as well as other chemistry souvenirs. The neighboring booths complemented the Cal ACS booth with the Contra Costa Sanitary

District booth on one side (featuring clean water initiatives and educating about water conservation and green chemistry values), and a booth of local artists on the other side showing uses of vibrant colors from plant products to produce art work.

The response from visitors to the Cal ACS booth was very positive. Children as well as adults participated in the water-themed hands-on demonstrations that included: 1. Producing color changes using pencil electrodes and red cabbage juice for water electrolysis (with generation of  $H^+$  and  $OH^-$  ions, and formation of  $H_2$  and  $O_2$  gas bubbles), 2. Observing exothermic decomposition of  $H_2O_2$  catalyzed with yeast to give  $O_2$  (the bubbling of  $O_2$  was enhanced by food coloring), 3. Floating paper clips on a water surface (illustrating surface tension), and 4. Comparing the number of drops of plain water vs. soapy water that can be placed on a penny before the water spills off the surface. Our exhibit on guessing plant smells and then building models of some molecules found in the plant fragrances with molecule kits (which look a bit like Legos for chemists) was a hit with children, parents, and grandparents alike, and was especially popular with teachers. A few children kept coming back, trying to build ever more complex molecules.



Perfect mild temperatures on a sunny day added to the success and gave us the opportunity to reach out to the public with eco-friendly chemistry activities. Our Section engaged children, young adults, teachers and other professionals. Participation by the Cal ACS section in this annual event continues to build a positive image of chemistry and science in general.

Sheila Kanodia and Margareta Séquin





## Fingerprinting Water (Part 2)

Bill Motzer

In Finger Printing Water Part 1 (April 2014 VORTEX), I described some plots and diagrams that could be used by defining water sources;

these employ major cation ( $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Na}^+$  and  $\text{K}^+$ ), anion ( $\text{HCO}_3^-$ ,  $\text{CO}_3^{2-}$ ,  $\text{Cl}^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{F}^-$ , and  $\text{NO}_3^-$ ), and trace element (Fe, Al, U, Cu, Pb, Zn, Cd, As, etc. – as various species) analyses typically used in intrinsic water quality investigations. Geochemists commonly report results in molar (mol/L) or molal (mol/kg) concentrations but charged specie equivalents may be recalculated as milliequivalents per liter (meq/L) from mg/L concentrations using the equation:

$$\text{meq/L} = (\text{mg/L} * \text{valency}) / \text{molecular formula mass}$$

However, before any of these analyses can be used in various plots and diagrams, the analytical accuracy must be determined. This is achieved by calculating a cation – anion balance (also known as a charge balance) for all of the intrinsic data, because ideally the solution should be electrically neutral (hence the term charge balance). For such an ideal charge balance, the sum of the anions in meq/L should equal the sum of cations in meq/L, calculated by the equation:

$$\text{Balance (\%)} = [(\sum \text{cations} - \sum \text{anions}) / (\sum \text{cations} + \sum \text{anions})] * 100$$

If results are within  $\pm 5\%$ , then the analysis is considered accurate. However, if the balance is greater than or less than 5%, then:

- (1) The analysis is poor or inaccurate.
- (2) Other constituents, such as trace ions, may have been present that were not analyzed.
- (3) The water was very acidic and hydrogen ions were not included.
- (4) Organic ions are present.

Another accuracy check is the ratio of total cations divided by total anions, which are also calculated in meq/L. If the ratio equals 1.0, or is at least between 0.90 and 1.10, the analysis is considered accurate.

In Part 1, I described plotting intrinsic data on Trilinear (Piper) and Schoeller diagrams to both classify and fingerprint water sources. Additional useful plots are described below.

Stiff Diagrams are straight-line plots of cation and anion concentrations also calculated in meq/L. They are constructed using at least four parallel horizontal axes on each side of a vertical axis (see first figure below). Cation and anion data are plotted and the individual points are connected to produce a polygonal pattern. Each water analysis may have a unique pattern or shape. For example, most natural groundwater forms an arrowhead shape with the point facing to the right, brine and/or seawater forms a T-shape, and water that has undergone ion exchange forms a backward check mark. The relative size of the characteristic stiff diagram is proportional to the total dissolved solids (TDS) with a larger stiff indicating higher TDS. The polygonal shape can be drawn on a map adjacent to the water sample collection site.

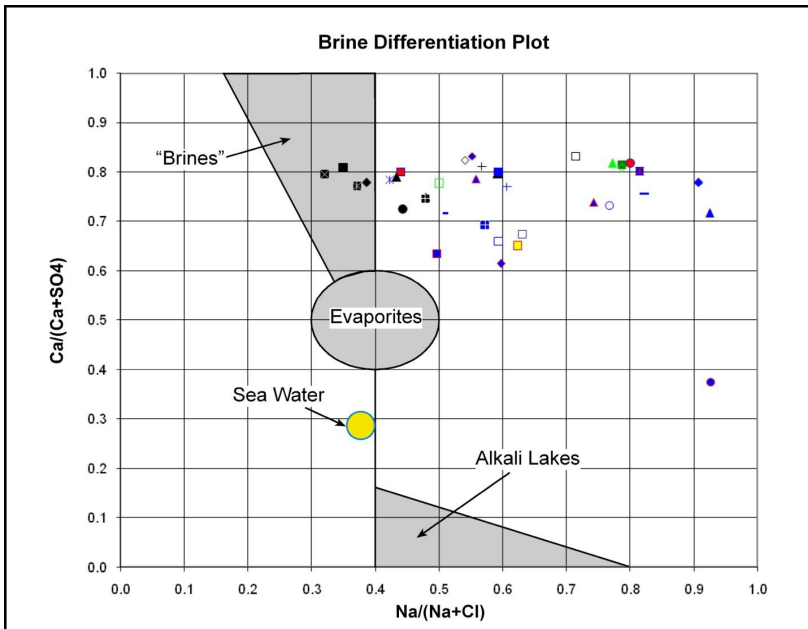
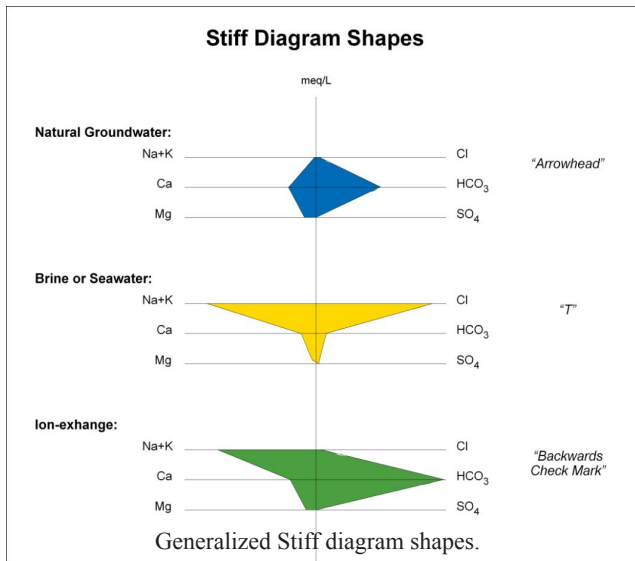
Brine Differentiation (BDP) Plots. The BDP was developed by Arthur Hounslow (Water Quality Data: Analysis and Interpretation, 1995, Lewis Publishers) to differentiate brine-contaminated waters and for waters of other origins (e.g., brines, evaporates, and sea water) using major constituents commonly available in a water quality analysis. For this type of diagram (see second figure), molar concentrations of calcium divided by calcium plus sulfate are plotted on the vertical axis and sodium divided by sodium plus chloride are plotted on the horizontal axis, allowing for plots in a finite range from 0 to 1.0 on both axes and to determine if mixing is occurring. One of the advantages of the BDP is that straight- and curved-line mixing ratios can be shown (third figure), particularly if end member concentrations (such as seawater or brackish water) are known. To determine different water sources, the BDP may be used in

*(continued on page 6)*



(Motzer continued from page 5

conjunction with the Schoeller diagram.



BDP showing fields for groundwater impacted from brines, evaporates, and alkali lakes.

## *Smoke & Mirrors*

Dr. Baum, Acting Editor-in-Chief of C&E News, in an editorial entitled “Oblivious to Science”, in the C&E News May 12, 2014 issue, labels people having an opposing view to his on genetically modified organisms (GMO) as being irrational, or to use his words, “immune to rational thinking.”

The main point of the editorial is to justify the GMO industry’s position to actively discourage labeling laws regarding GMOs in food. I do agree with Dr. Baum in supporting the use of the term Genetically Engineered (GE) rather than either GMO or GM when talking about GE food. It was not so much that I disagreed with Dr. Baum’s view (and I do) but that he used a questionable source to support his position and *non sequiturs* in his arguments.

The referenced report is from the Council for Agricultural Science & Technology (CAST). CAST is a nonprofit organization composed of scientific societies and individual student, company, nonprofit and associate society members. But is it independent and unbiased? At least four of the five top executive officers are recipients of awards, funding or are co-authors on technical papers with corporations who are the major participants in the industry supporting in every way the position and conclusions in the CAST report. The four authors of the paper cited by Dr. Baum have very similar connections and affiliations. The following link provides some detailed information on CAST, its membership and the authors of the referenced paper. [http://http://www.nhrighttoknowgmo.org/Of\\_Interest/Of\\_Interest.html](http://http://www.nhrighttoknowgmo.org/Of_Interest/Of_Interest.html) From the title of Dr. Baum’s editorial “Oblivious to Science” one would expect to read scientific arguments, but instead we got a number of *non sequiturs*.

**The first:** “The fact is that almost everyone in the US has eaten GE food in the past decade.” Even if true it does not indicate that it is safe for people, animals or the

environment. However, no epidemiological studies in human populations have been carried out to establish whether there are any health effects associated with GE food consumption. The usual follow-up statement, “GE foods are safe because hundreds of independent studies have shown that this is the case” What we are not told by Dr. Baum, and the companies which are vigorously fighting against the labeling laws is that there are few if any independent long term studies that prove that GEs are safe for children, pregnant women or to anyone. Indeed some of the so-called independent studies have been questioned because the authors of those studies have a significant connection with the industry that compromises their independence. If you were a researcher in this field would you challenge companies like Monsanto which provide funding for a lot of major universities? A few have, and have suffered either personally, professionally or both. The following link provides some insight to studies in other parts of the world. <http://www.ensser.org/>

**A second:** “In fact, many GE crops have been approved in the U.S”. The approval process has more to do with the lobbying power of corporations than with a concern for safety.

**A third non sequitur:** “The right to know what is in food is different from the right to know how it was produced”. Here the GE industry is just parsing phrases.

It seems fundamental that, “If an action or policy has a suspected risk of causing harm to the public or to the environment, in the absence of scientific consensus that the action or policy is harmful, the burden of proof that it is not harmful falls on those taking action.”

The views expressed in this article are mine and do not necessarily reflect those of the California Section or any of its officers.

Lou Rigali, Editor, *The Vortex*

## *Women Chemists Teach Paper Chromatography to 7th and 8th Grade Girls, 4/5/2014*

Janet Schunk and Elaine Yamaguchi

It was April 5, 2014, and the Sonoma State University campus was filled with the activity of this year's Expanding Your Horizons (EYH) Conference for young girls. The EYH Conference is designed to expose young women to exciting careers in math, science, technology, and business. The Sonoma County EYH Chapter conference is targeted to seventh and eighth grade girls and is co-sponsored by Sonoma State University, Santa Rosa Junior College, and Agilent Technologies.

A team from Agilent Technologies takes the lead in organizing the event, which alternates between Sonoma State and Santa Rosa Junior College as the host site. Janet Schunk and Elaine Yamaguchi have been presenters at this event for fifteen years.

The conference is organized so that the girls attend three (3), 50-minute workshops. Some of the workshops this year addressed topics such as architecture, dissecting hearts, and geometry.

Our workshop focused on paper chromatography, a technique to separate mixtures often used by chemists in real life, and we introduced to them terms such as mixture and mobile and stationary phases. Separating mixtures may sound dull, but we spiced it up by using "design of experiment" with three (3) different brands of paper towels, our stationary phase. We then asked the girls to use a water soluble black marker, our mixture, and see what happens when

water is used as the mobile phase. Their observations filled the discussion section of the workshop. They noticed that black was actually a mixture of several colors, and there was a significant difference in the speed of elution of the water depending on the brand of paper towel, giving rise to big or small separation of the colors comprising black.

Next we changed the design, by introducing a different brand of black marker, Mr. Crayola, which behaved differently from the first black marker. The girls noticed the separation was not nearly as good as the first marker.

The third part of the workshop, the girls created their own experiments to separate other colors, based on the results from the first two experiments. Some mixed color markers together, others applied patterns of color to the paper towel strips.

The girls recorded their "experimental design", what color markers used, and outcomes, strips of paper towels, on a worksheet. This was their work product for the workshop.

At the end of each workshop, the girls filled out a workshop evaluation form, to provide feedback to the Agilent Technologies team on how the workshop went from the student's viewpoint. I told the girls this is a quality technique, an assessment tool for continuous improvement.

Janet and Elaine thoroughly enjoyed presenting this activity and hope to return next year. Any other volunteers are welcome to help with Goal 3 of the Strategic Plan of the ACS by fostering the development of the most innovative, relevant, and effective chemistry education in the world.



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*(Chair Continued from page 3)*

Career Fair, with its resume reviews, mock interviews, job interviews, and workshops. I will be there much of the time from Sunday through noon on Wednesday wearing one of my other ACS hats, that of an ACS Career Consultant.

Looking beyond the National meeting, several events are shaping up for the fall season, particularly in conjunction with National Chemistry Week, the third week of October. In addition to our traditional Family Science Night at an area middle school, with

the NCW theme being the "Chemistry of Sweets – Candy," we are considering tours of local candy companies on each weekend at the start and end of NCW. CALACS will continue to have a booth with demos at the Solano Stroll in September and at the Bay Area Science Festival in November. At least one local section meeting more convenient for our North Bay members is being planned, and if we can find a venue that combines our ability to have a dinner, along with the

*(Continued on page 9)*





Mark Frishberg, Section Chair, presents the Community College Faculty award to Michael Ansell.

*What You Always Wanted To Know About Attila Pavlath But Were Afraid To Ask.*

At the Fall ACS Meeting in San Francisco (Aug. 10-14) the ACS Division of the History of Chemistry will present a half day symposium titled: Science and Legacy of Attila Pavlath to pay tribute to his career of 60+ years not just in chemistry but also to his activities for improving the American Chemical Society and the public image of chemistry. Six speakers will present short talks about various aspects of his life, character and philosophy.

J. Hayes, Organizer, Presiding  
(Location is not known yet.)

8:00 Introductory Remarks.

8:10 29. Dr. Attila Pavlath and the California Section of the American Chemical Society. P. F. Vartanian

8:40 30. Promoting public image for chemistry: Attila Pavlath's contribution to ACS's international recognition. F. Darvas

9:10 31. Survivors' tales: ACS staff recollections of a super active president. F. E. Walworth

9:40 Intermission.

9:55 32. Brief summary of Dr. Attila Pavlath at the USDA Western Regional Research Laboratory. J. W. Finley

10:25 33. Attila Pavlath: Leader, Mentor, Scientist and Friend. E. A. Nalley

10:55 34. Always a pioneer: sic itur ad astra! G. A. Pavlath

11:25 35. Reflections on my life. A. E. Pavlath

*(chair continued from page 8)*  
availability of a grand piano, one of our local section members is prepared to share stories from his chemistry career with music and song in what could be called a chemistry cabaret.

Please participate when you can, and please offer your suggestions for other events and activities if any might better serve your needs and interests.



## Women Leaders of the Global Chemistry Enterprise

Please save the date for Tuesday, August 12, 2014 at the 248<sup>th</sup> national ACS meeting in San Francisco for an extraordinary and inspiring symposium on “Women Leaders of the Global Chemistry Enterprise.” In my worldwide travels last year as ACS President, I was invited to visit many chemistry communities and met some outstanding women leaders.

It occurred to me that I should invite some of these pioneering women role models to share their personal and professional journeys. I invited women speakers for this exciting symposium in San Francisco from Asia, Africa, South America, Europe and USA. Their remarkable stories of achieving both career and personal satisfaction through overcoming barriers with determination and hard work will encourage younger professional women with their careers.

Invited speakers include CEO and Executive Director of the world’s largest scien-

tific society ACS, one of only two female Priestley Medalists, Past ACS Presidents, the first female Director of a prestigious Indian Institute of Chemical Technology, the first woman from Saudi Arabia to earn a chemistry Ph.D., President of a non-profit foundation, a corporate Vice President, as well as a Dean, professors, scientists, and more.

This exciting all day symposium is an ACS Presidential Recommended event with WCC (Women Chemists Committee) as the lead sponsor. Co-sponsors include PROF (Division of Professional Relations), IAC (International Activities Committee), HIST (Division of History of Chemistry) and other supporters.

Please join us for this inspiring symposium on Tuesday and meet these international women leaders who will be attending the WCC Luncheon as our invited guests!

Dr. Marinda Li Wu, 2013 ACS President



## Earth Day with The Chemistry Club of CSU Stanislaus

Eshani Nandita Vice President of the ACS Student Affiliates, CSU Stanislaus.

For Earth Week, we raffled items such as the ACS mole, our club shirt, Starbucks gift card, and the periodic table blanket. The money made was donated to the California Trans-Pathway, so that they can purchase and grow trees, shrubs, and bushes, similar

to that from the Sierra Nevadas. This will preserve the ecology of those areas.

We also did an event out in the quad



where we showed non-science majors chemistry demos. One of them was how to blow up a balloon using baking soda and vinegar. We also had the chance to give away recyclable key chains made from bottle tops.

Earth Week was definitely a great experience for our volunteers and non-members. Everyone had the chance to

learn about the ecological importance of the California Trans-Pathway on our campus and about Green Chemistry!



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