

# THE VORTEX

AMERICAN CHEMICAL SOCIETY  
VOLUME LXXIV NUMBER 6

CALIFORNIA SECTION  
June 2013



Paul Friedman, volunteer with CalACS at Earth Day celebration, Martinez California

## Table of Contents

CHAIR'S MESSAGE	PAGE 3
LIST OF 50/60/70 YEAR MEMBERS	PAGE 4
CALIFORNIA SECTION ELECTION INFORMATION	PAGE 4
SECTION DUES	PAGE 4
WESTERN REGIONAL MEETING	PAGE 5
THE DIRT ON DRY CLEANING PART 3 (W. MOTZER)	PAGE 6
VOLUNTEERS NEEDED	PAGE 7
WCC MEETING	PAGE 8
EARTH DAY REPORT	PAGE 8
WCC MARCH MEETING REPORT	PAGE 9
BUSINESS DIRECTORY	PAGE 11
INDEX OF ADVERTISERS	PAGE 11



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# THE VORTEX

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  
Printed in USA on recycled paper

510-268-9933

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## Chair's Message

Wally Yokoyama

I want to wish all of you a wonderful summer since we will not meet again until September. Meanwhile, don't forget that the

Section is a principal organizer of the 44th Western Regional Meeting, Santa Clara, CA on Oct 3-6, 2013 [www.wrm2013.org](http://www.wrm2013.org). This is a great opportunity for local and regional (even Nevada, Oregon and Southern California) students to attend and present their research, interact with their peers, as well as to meet national and international known scientists. In addition to the Conference there is Great America Amusement Park and the Intel Museum. In nearby San Jose, the Tech Museum of Innovation, Rosicrucian Egyptian Museum, Quilt Museum, Japanese Friendship Garden and Children's Discovery Museum. There will be a great exhibition of scientific instruments at this meeting since many of instrument companies are headquartered in or around Santa Clara.

In addition to WRM the section will field a booth at the Solano Stroll, Albany, CA on Sunday, 10 AM-6 PM, September 8. If you have never been, you should attend. It is free and about a mile of booths of every type of cuisine, most Bay Area community service organization, youth groups, dance

troups, and bands The section is organizing and fielding a science afternoon with a "Fun with Food" theme at the San Leandro Library on Saturday, July 13. Please contact Dr. Alex Madonik or the office about this event. Every summer the section also sponsors paid chemistry internships for about 30 high school students at laboratories throughout the Bay Area. While the students work in the laboratory for 10 weeks during the summer, ACS volunteers start in March to recruit both students and mentors and work with them throughout the summer. This program has changed the lives of thousands of young people throughout the country since its inception by the California section over 30 years ago. In this section we acknowledge and thank all who have contributed to Project SEED and in particular Chevron Corporation. While ACS members voluntarily donate their time and talents, many outreach activities require supplies that do cost money. The section is able to provide these supplies from the voluntary annual dues (\$15/yr) that you pay. Thank you for voluntarily supporting these programs.



*Next Vortex is September 2013.*

Visit the website, [www.calacs.org](http://www.calacs.org), for latest information on meetings and news.

Lou Rigali, Editor

## May Awards Meeting

The California Section, together with the American Chemical Society, honors those members who attain 50, 60 and 70 years of membership. The list of those in the California Section who have attained these honors this year includes:

50 Years	60 Years	70 Years
Robert D. Athey	William W. Armstrong	Eugene C. Coyner
Robert G. Bergman	James M. Caraher	Gus D. Dorough
Todd C. Detzel	Stanley S. Furuta	Erich Heftmann
Mary Morrison Exner	Jackson E. Harrar	Ernest S. Kuljian
Nicholas J. Haritatos	Claire Nobles Lieske	Rollie J. Myers
Jack F. Kirsch	Chin Tzu Peng	Paul E. Porter
Chien Chang Lin	Eugene Zavarin	Tom R. Thomson
Elek Lindner		William W. West
James R. Lowell		Raymond A. Wilson
Joseph M. Muchowski		
John J. Natt		
John F. Sebastian		
Howard A. Storms		
Florence E. Torba		
Masao Ueda		

Attila Pavlath, former ACS President, and twice former California Section Chair presented the awards to the distinguished members who attended the luncheon. Dr. Pavlath also presented the Section's 2013 Petersen award to Allen "Al" Verstuyft, and the Lloyd Ryland Outstanding High School Chemistry Teacher award to Sai Kumar from Mission San Jose in Fremont. She teaches AP Chemistry and has increased test scores with her tutoring, group problem solving, and interactive labs.



### California Section Election – 2013

The California Section, ACS, will hold an election this fall for the following positions: Chair-elect, Treasurer, Director, Councilors, Alternate Councilors, and Members-at-Large. All these positions are members of the Section's Executive Committee, and the first three positions are members of the Section's Board of Directors. If you have an interest in being a candidate for one of these positions or would like more information, please contact Paul Vartanian [(510) 763-0195, [pfvartanian@gmail.com](mailto:pfvartanian@gmail.com)], a member of the Nominations and Election Committee, or James Postma [(530) 898-5159, [jpostma@csuchico.edu](mailto:jpostma@csuchico.edu)], the chair of the committee, by September 1, 2013. While the first five elected positions may be filled only by full members of the ACS, the positions of Member-at-Large are open to both members and student members of the Society.

### Section Dues

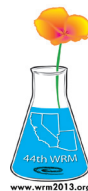
Your dues to the California Section are voluntary. ACS transfers funds when you renew your membership if you authorize payment. Only one third of our members authorize those voluntary payments. It is possible that the payment option for local section dues is overlooked. For that reason the Executive Committee will be offering a simple and convenient method for members to make voluntary contributions. Your Section uses these dues and contributions to fund needed outreach programs in the community, particularly with students and schools.



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The San Francisco Bay Area and Silicon Valley, with a population of around 8 million people, is the 5<sup>th</sup> largest metropolitan area in the US, 55<sup>th</sup> in the world, and is known worldwide for its diversity, scenic beauty, and entrepreneurship. Also home for more than 8 thousand chemists, and probably twice that number who use the tools and fundamental principles of chemistry in their research and development programs every day.

Information concerning details of registration, the technical sessions, and Expo are all listed with links on the website, **www.wrm2013.org**.

### *Timelines*

Open now: Registration for exhibition space and sponsorship is open now, check the website, **www.wrm2013.com**. There are early registration discounts until **July 1**. Space will be assigned on a first come basis. We encourage commercial vendors to exhibit their products and services, and academic and non-profit institutions to highlight their graduate programs.

Open now: Closes **August 23**: Program and Abstract Creation System (PACS), the abstract submission system is linked to the **www.wrm2013.org** website. We suggest that vendors and members view the scope of topics, the list of invited speakers and the names of the session organizers.

Open Now: General registration with early registration discounts until **September 12**. There are reduced registration fees for students and pre-college instructors, retired, and unemployed members.

### *Sponsorship*

In addition to and separate from exhibiting, there are many good opportunities to highlight your company at the only ACS meeting to be held in California until August 2014! With a great location in the Bay Area and over 7000 ACS members between the two sections, and twice as many in the region, we are expecting an attendance of chemists, faculty, graduate students and undergraduates of over 1000. For information see **www.wrm2013.org**.

We are actively seeking Sponsors for various aspects of the meeting. This represents an excellent opportunity to have your company's name and logo prominently displayed at the meeting, in publicity materials, including the Program Book, and on our website. Also included are various numbers of regular admissions (can be used for employees, clients or anyone you designate) and signage placements. The levels are:

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**Silver** \$2,000 Registration for 5, quarter page ad in program

**Copper** \$1,000 Registration for 2, quarter page ad in program

Session Sponsor \$750

Non-profit sponsor \$375

*(Continued on page 7)*



## *The Dirt on Dry Cleaning Part 3*

Bill Motzer

In Part 1 (January 2013 Vortex and Part 2 (March 2013 Vortex), I described the history of dry cleaning from Greco-Roman

times until the Industrial Revolution. By World War II, tetrachloroethene [aka perchloroethylene or PCE ( $C_2Cl_4$ )], commonly called perc, became the most popular solvent for cleaning because it offered excellent cleaning power, particularly to delicate fabrics, and because it is non flammable. Prior to its use, gasoline and other flammable solvents were used as dry cleaning agents resulting in numerous fires and explosions that ultimately resulted in the ban of dry cleaners from residential area. In the 1930s and 1940s, professional dry cleaners began embracing PCE's relatively nonexplosive characteristics allowing them to move back into residential and commercial areas. By 1948, PCE had replaced carbon tetrachloride ( $CCl_4$ ) as the leading chlorinated dry cleaning solvent and by 1950, the U.S. dry cleaning industry was using  $>3.06 \times 10^8$  kg of PCE but only  $6.8 \times 10^7$  kg of  $CCl_4$ . However, because of  $CCl_4$ 's toxicity and associated equipment corrosion problems, its use as a dry cleaning solvent was subsequently discontinued. By 1962, PCE became the leading cleaning solvent of choice in the U.S. with the dry cleaning industry accounting for approximately 90% of its consumption.

By 1986, there were 21,787 dry cleaning plants and facilities in the U.S., of which 16,305 (74.8%) were commercial, 4,300 (19.7%) were coin-operated, and 1,182 (5.4%) were industrial laundry/dry cleaning. Of these, 18,899 (86.7%) used PCE, 2,349 (10.8%) used petroleum solvents, 489 (2.2%) used Valclene® (fluorocarbon 113 or trichlorotrifluoroethane), and 50 (0.2%) used trichloroethane. Use of solvents often indicates production of hazardous wastes, and dry cleaning is no exception. Wastes include:

Cooked muck a powder residue for the waste generated by distilling residue containing solvent, powdered filter material (usually

diatomite), carbon, non-volatile residues, lint, dyes, grease, soils, and water. It is considered to be a hazardous waste.

Sludge: a solid residue from the still containing solvent, water, soil, carbon, and other non-volatile residues. Still bottoms from chlorinated solvent dry cleaning operations are classified as hazardous wastes. Still bottoms from machines using other solvents may also be hazardous due to toxic constituents in fabric dyes and notions.

Spent filters: used in PCE-based machines are also regulated as hazardous waste.

Separator water is that which separates and must be removed from the dry cleaning solvent. For PCE-using dry cleaning machines it is a regulated hazardous waste.

In September 1986, the U.S. EPA implemented a notification deadline for small quantity generators of hazardous waste under the Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA). This resulted in most PCE-using dry cleaners shipping PCE-containing wastes offsite as hazardous.

However, wide usage and mishandling of PCE and PCE wastes along with other chlorinated solvents soon led to soil, surface water, and groundwater contamination. It was also widely assumed that because of its volatility, spilled or released PCE would volatilize solely to the atmosphere (which is not the case and will be discussed in more detail). In the mid 1980s, many banks and other lending institutions began requiring environmental evaluations of commercial properties before granting loans. These investigations were called Phase 1 Environmental Site Assessments (ESAs) if only a site visit and regulatory review were conducted. If the Phase 1 ESA indicated possible subsurface contamination, a Phase 2 ESA would be requested, requiring subsurface soil and groundwater sampling. In California, PCE contamination began showing up at many strip malls containing dry cleaners. This was substantiated by a 1988 survey of U.S. dry cleaning equipment and plant operations conducted by the International Fabricare Institute which reported that 70.7% of the 909 respondents discharged dry cleaning equipment separator water to either the sanitary

*(Continued on page 7)*



*(continued from page 5)*

For sponsorship of bags, special events and breaks, please contact us to discuss opportunities. Advertising space is also available in the Program Book. We are open to other ideas as well. Contact the general chairs at [chair@worm2013.org](mailto:chair@worm2013.org) for more information. We are a 501(c) organization.

The technical program will cover many aspects of chemistry from traditional areas to more specialized programs. There will be programs for educators at all levels. Workshops are scheduled in career development, Leadership Development and Safety. A special workshop in Polymorphs and Salt Selection will be co-hosted by CACO-PBSS.

Special events will include the regional awards banquet with a talk by Priestly Medalist Dr. Richard Zare, and evening events with Dr. Charles Bamforth on beer, and Shirley Corriher and Dr. Sara Risch on flavor chemistry. Luncheons with ACS President Dr. Marinda Wu sponsored by the California Section WCC and an ACS Governance lunch with members of the Board of Directors are also planned. A Sunday public outreach event at Great America Theme Park is also in the works. Make your plans now to exhibit at a great meeting. We look forward to hearing from you soon.

Natalie McClure, Santa Clara Valley Section  
Lee Latimer, California Section

General Co-Chairs

**Volunteers Needed**

Volunteers are needed to work on many aspects of the WRM meeting, please contact [chair@worm2013.org](mailto:chair@worm2013.org).

*(continued from page 6)*

sewer or to a septic system.

In April 1989, the City of Lodi, California detected PCE in groundwater samples collected from two of its municipal wells at concentrations exceeding the California Maximum Contaminant Level for drinking water (5.0 µg/L). This discovery soon led to more extensive investigations in the Central Valley subsequently identifying over 50 potential contaminant sources, including many dry cleaning facilities. In March 1992, a now famous study by Victor Izzo of the Central Valley Region, California Regional Water Quality Control Board (RWQCB), identified sanitary sewer lines as “the main discharge point for dry cleaners” for wastewater containing “dissolved PCE ... pure cleaning solvent and solids containing PCE.”

Toxicological studies of PCE conducted by regulatory agencies soon found considerable health-related problems associated with PCE use resulting in more regulatory controls in the 1990s. For example, in 1991, California adopted Proposition 65, which declared PCE

as a toxic chemical and likely carcinogen. In 1992, the U.S. EPA completed a study finding that just bringing PCE dry cleaned clothes into your home resulted in elevated PCE levels throughout the home. By 1993, the California Air Resources Board (CARB) adopted regulations to reduce dry cleaners’ PCE emissions.

Throughout the last half of the 1990s considerable subsurface investigations along with focused research on the geo- and biochemical properties of chlorinated solvents, particularly the chlorinated ethenes and ethanes, resulted in numerous scientific publications and litigations. In 2000, The City of Lodi filed a suit in Federal District Court against dry cleaning chemical manufacturers and 15 Lodi businesses, including several dry cleaners, for PCE contamination to some of their water supply wells. In June 2006, the jury awarded the City over \$178 million dollars in compensatory and punitive damages for PCE contamination of its water wells and other city properties.



## *WCC meeting- June 22, 2013 Butterflies, Insects and Chemical Snippets*

Join the Women Chemist Committee for their meeting on  
Sat. June 22, 2013  
at Tilden Park Botanic Gardens  
Berkeley California

Topic: Butterflies, Insects and Chemical Snippets  
Speaker: Sal Levinson

### Time

10:00 am to 11:00 am – Meet the speaker

11:00 am to 12:00 pm – Hear the “Caterpillar Lady” Ms Sal Levinson

12:00 pm – Bring your own lunch for picnic on the TRPBG grounds

Cost: Free

## *Earth Day 2013*

CalACS participated in community outreach at the 2013 Earth Day Event in Martinez, CA. This annual festival at the John Muir National Historic Site brought together representatives of 49 groups to engage the public in celebrating both Earth Day and John Muir’s birthday. Hundreds of adults, children, and families attended. Volunteers working at the CalACS table during the day were Elaine Yamaguchi, Anne Frazer, Eileen Nottoli, Paul Friedman, Nicki Davis, Jeanne Pimentel and Sheila Kanodia. Alex Madonik provided materials for the hands-on demonstration on plastic recycling based on density characteristics

for some recyclable plastics.

Margareta Sequin provided the poster board for the plants and fragrance activity.

Many volunteers wore the Section designed T-shirt to promote our belief in sustainability. This was the 10th Anniversary of the Earth Day celebration by ACS and many more by our section. The theme of this year was “Our Earth: Handle with Care” developed by the ACS Committee on Community Activities (CCA) as part of its Chemists Celebrate Earth Day (CCED) Program.

The response from visitors to the Cal ACS canopy location was positive. Our canopy displayed many posters, T-shirts

with chemical structures, a periodic table, and earth day balloons. Outreach activities used the CCED Earth Day brochure as well as other conceptual aids. Kids as well as adults participated in several hands-on demonstrations on the pH of various household materials using universal indicators and pH paper made with purple cabbage juice, the separation of plastics, fragrances of plant materials and molecule-



Sheila Kanodia, Eileen Nottoli, Nicki Davis, Paul Friedman, Elaine Yamaguchi, Anne Frazer

*(Continued from page 10)*



*Women Chemists Committee (WCC) Meeting, March 30, at the Lawrence Berkeley National Laboratory, "Visualizing Protein Interactions to Understand Huntington's Disease"*

Esther Jang, Esther Kim

Christie Canaria is a biological research scientist at the Lawrence Berkeley National Laboratory. Her research area is on neurodegenerative diseases, such as Huntington's disease, by utilizing fluorescent protein markers and advanced microscopy techniques to probe the interactions between huntingtin proteins and cholesterol transporters. The WCC invited Dr. Canaria to address our group of 35 attendees at the first WCC meeting of 2013.

Christie's love for chemistry began during her high school years. Through the recommendation of her chemistry teacher, she became involved in the National Scholars Program where she began her research career with a professor at UCSD. It was through this research opportunity that she was first introduced to the photoluminescent properties of silicon.

After earning her bachelor's degree in chemistry from UCSD, she spent two years working for a small biotech company named Illumina. After two years in the industry, she decided to obtain a PhD at the California Institute of Technology where she gained experience with biosensors, microfluidics, and nanocantilevers.

While completing her post doctorate, she was exposed to the fluorescent proteins that ensured a more effective imaging process than the organic dye method. They were first detected in jellyfish, and the encodings of such proteins were modified and cloned into another cell. It was determined that when a Green Fluorescent Protein (GFP) is tagged onto another protein gene, it allows the protein to be tracked by fluorescent microscopy. As an example, when nuclear proteins are GFP tagged, cells can be visualized during the meiosis. During her study, she was given the opportunity to visualize the formation of the blood vessels of a live quail embryo using this technique with fluorescent proteins.

Her recent work focused on understanding Huntington's disease through visualization of the interaction of huntingtin proteins with cholesterol transporters. Huntington's disease is a neurodegenerative disease such as Alzheimer and Parkinson's disease. They are all rooted in aberrant protein interaction. Although the gene is present at birth, the symptoms appear at later stages of people's lives. The symptoms include the loss of motor and cognitive functions.

Huntington's disease is caused by excessive expansion of the CAG sequence within the huntingtin gene, which encodes the amino acid glutamine. This gene is essential for the body because it helps with the functioning of mitochondria, the transport of cargo, the control of cholesterol levels, the regulation of waste, as well as many other functions. The one related to the brain transports cholesterol, which gives fluidity and flexibility to the cell membrane and neural networks. While a normal person would have 10-26 repeats of CAG, a person affected by the disease may carry a gene that has caused mutation and has more than 37 repeats.

Christie was able to visualize the huntingtin gene and transporter (Cav 1), using different color markers of fluorescent proteins and found out that the mutated gene produces lumped cholesterol. She also tried to observe the interaction between the Huntingtin gene and transporter but the interaction could not be determined or resolved with the current level of microscopic techniques. She was finally able to find evidence via a phenomenon called Fluorescence Resonance Energy Transfer, which indicates protein-protein interaction through the changes in intensity of the fluorescent proteins. By doing so, she observed color change, an indication of energy transfer, when the gene and transporter were very close to each other.

In order to find the exact location of the interaction domain of huntingtin gene and transporter, the whole gene was artificially mutated to test the interaction efficiency level. The interacting domain for the huntingtin gene was found to be different from the CAG expansion region (which causes disease) of the gene. Christie hopes that

*(continued on page 10)*

(continued from page 8)

model building. One had to be there to appreciate the energy and enthusiasm of the kids trying to make molecules of unique kinds using C, H, O, P, S and N atoms and bonds. Young professional adults were eager to claim the prize shirt with a caffeine structure thinking that if they could just locate the element Me in the periodic table, it would be theirs. They were disappointed to learn that Me represented a methyl group and it was not an element in the periodic table.

Our section engaged kids, young adults, teachers and other



professionals.

The participation by CalACS section in the event continues to build a positive image of chemistry and science in general.

Sheila Kanodia, Alex Madonik

(continued from page 9)

understanding this interaction between huntingtin gene and transporter gene will open a way to cure the disease.

This event allowed many interested folks to interact. Especially in the meet-and-greet period of the meeting, undergraduates mingled with working chemists, biologists, and retirees. This was a learning experience for all of us. In fact, the two authors of this report are chemistry majors at Cal.



# BUSINESS DIRECTORY

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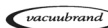
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