

THE VORTEX

AMERICAN CHEMICAL SOCIETY
VOLUME LXXIX NUMBER 6

CALIFORNIA SECTION
JUNE 2017



Celebrating Earth Day at John Muir Historic National Site

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Women Chemists Committee California Section American Chemical Society

All are welcome. Saturday, June 10, 2017 USDA, 800 Buchanan Street Albany, CA 94710.

Speaker: Dr. Rebecca Sutton

Topic: Science to Inform and Advance Environmental Protections

Time: 10:30 a.m.-11:00 a.m. Snacks and coffee, 11:00 a.m. Discussion and lunch

Registration: Please register (including lunch or for talk only) by email to office@calacs.org or by phone 510.351.9922. If mailing a check in advance, please make payable to: "California Section ACS" and send to Cal Section Office, 2950 Merced Street #225, San Leandro, CA 94577, postmarked no later than June 5, 2017.

Cost: Technical discussion is free, \$15 lunch (\$7 for students and the unemployed).

Abstract: Dr. Rebecca Sutton joined San Francisco Estuary Institute (SFEI-ASC) in 2013 as a senior scientist for the Regional Monitoring Program for Water Quality in San Francisco (Bay RMP).

Dr. Sutton leads the RMP's Emerging Contaminants Workgroup and a team of scientists investigating contaminants of emerging concern and microplastic in the San Francisco Bay and other regions of California. She also manages SFEI-ASC's Green Chemistry focus area, providing information to inform policies designed to prevent pollution through reduced use of toxic chemicals. Dr. Sutton has been appointed to California's Green Ribbon Science Panel to aid in the implementation of the state's

Safer Consumer Products Regulations.

Dr. Sutton received her BS in environmental resource science from the University of California, Davis and her PhD in environmental chemistry from the University of California, Berkeley. Her dissertation explored molecular-scale interactions affecting contaminant fate and transport as well as soil carbon storage to mitigate climate change. Before joining SFEI-ASC, Dr. Sutton was a senior scientist with research and advocacy nonprofit Environmental Working Group, where she conducted research on chemicals of concern in air, water, soil, consumer goods

Biography: Policy makers need solid scientific evidence to make informed decisions that protect people and wildlife from harmful chemicals. Data are particularly lacking for contaminants of emerging concern (CECs), chemicals that are not regulated or monitored and that have the potential to enter the environment and cause human or ecological adverse impacts.

A global leader in this field, the Regional Monitoring Program for Water Quality in (RMP) seeks to identify emerging contaminants before they rise to levels that cause harm to the Bay. Assessing the risks that emerging contaminants pose to wildlife and surrounding communities requires information about the levels of these chemicals in the Bay, how they move and persist, and how toxic they are.

The RMP's decade-long effort to identify CECs has produced a high-quality body of knowledge on Bay contamination, making this one of the most thoroughly monitored aquatic ecosystems in the world. This information has allowed policymakers to develop sophisticated approaches to solving emerging water quality issues. Dr. Sutton will present recent examples of monitoring studies that inform policy, including research on flame retardants, pesticides and microplastic.



Summer Vacation

Each Year the Vortex takes Summer Holidays. The next Vortex will be in September. Deadline for Submission is August 15.

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 \$15 annual dues payment. Nonmember subscription \$15.

MAGAZINE OF THE CALIFORNIA SECTION, AMERICAN CHEMICAL SOCIETY

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Box 1150 Marshfield MA 02050-1150 781-837-0424

OFFICE ADMINISTRATIVE MANAGER:

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2950 Merced St. # 225 San Leandro CA 94577 510-351-9922

PRINTER:

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

Although it's not officially summer, it's already reached 100°C in Chico, and with increased temperature, activities are increasing in the Section, as a chemist would expect. But our meeting schedule is a bit lighter in the summer and hopefully you'll have some time to relax and refresh this summer.



If you need suggestions for your summer reading list, I'd like to recommend *The Making of the Atomic Bomb* by Richard Rhodes. Perhaps you've already read it as it was written back in 1986. I'm only halfway through it, but have found it to be fascinating (and not ghoulish.) It gives a good history of the discovery of the elements pre- and post-uranium with useful descriptions of their historical context and of the personalities of the key players in the discovery process. What's often not discussed in chemistry books are the dead ends and wrong guesses that were (and are) a part of the discovery process.

Another book you might enjoy (after having seen the movie) is *Hidden Figures* by Margot Lee Shetterly. The movie is good but the book tells a much broader story and covers many more characters. While this period of our history is painful at times,

the demonstrated courage and persistence is inspiring.

Here are a few more recommendations: *Napoleon's Buttons: How 17 Molecules Changed History* (Penny Le Couteur and Jay Burreson): This book is a fascinating study of history and economics structured around 17 chemical substances that are (or were) in great demand.

The Disappearing Spoon: And Other True Tales of Madness, Love, and the History of the World from the Periodic Table of the Elements (Sam Kean): If you enjoy history but need more adventure and intrigue in your literature, try this one out.

The Poisoner's Handbook: Murder and the Birth of Forensic Medicine in Jazz Age New York (Deborah Blum): For fans of CSI (or Agatha Christie) this is the one. If you like "happily ever after" tales, perhaps you should choose another.

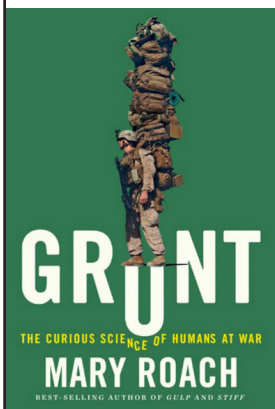
Periodic Tales: A Cultural History of the Elements, from Arsenic to Zinc (Hugh Aldersey-Williams): This may be the one for those already interested in chemistry. It describes the quirky history of the names and origins of the elements and their uses.

The Joy of Chemistry: The Amazing Science of Familiar Things (Cathy Cobb and Monty I Fetterolf): This may be the one to use for recruiting new chemists to the fold. It describes the fascinating chemistry of familiar phenomena such as the turning of

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*Lafayette Library and Learning Center Foundation Presents
Mary Roach, author of Grunt, The Curious Science of
Humans at War.*

Tuesday, June 20, 2017· 7:00 PM - 8:30 PM Located at the Community Hall



Science writer Mary Roach tackles the science behind some of a soldier's most challenging adversaries: panic, exhaustion, heat, flies, noise – and introduces us to the scientists who seek to conquer them.

Mary Roach is the author of *Stiff: The Curious Lives of Human Cadavers*, *Gulp. Adventures on the Alimentary Canal* and *Packing for Mars: The Curious Science of Life in the Void*.

Jason Mark, editor-in-chief of *Sierra* magazine will interview Mary Roach.

Tickets: \$10

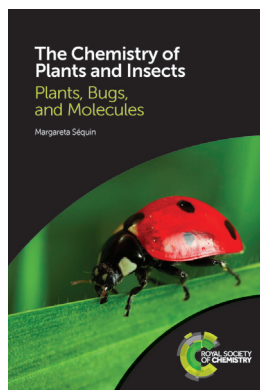
Reserved seat & a copy of *Grunt*: \$23 Lafayette Library and Learning Center Foundation
3491 Mt. Diablo Blvd. Lafayette, CA 94549 (925)283-6513

Margareta (Greti)Sequin, Chair-Elect of our ACS California Section, just published her new book “The Chemistry of Plants and Insects, Plants, Bugs, and Molecules”, Royal Society of Chemistry, Cambridge, UK, May 2017.

By the author of the popular book, *The Chemistry of Plants: Perfumes, Pigments, and Poisons*, this book benefits from Margareta Séquin's vast experience leading field trips and seminars to botanical gardens and nature reserves, and teaching chemistry to beginners.

Organic chemistry is often seen as a challenging, sometimes abstract field. This book makes chemistry exciting and accessible for readers interested in a deeper understanding of the natural world. The book is organized according to the increasing complexity of compounds introduced, and so it also serves as a useful teaching aid for undergraduate chemistry or biology courses, and as a supplementary text for students in plant sciences, ecology, and entomology, and in horticultural programs.

Order from your independent bookseller or Amazon Copyright: 2017 Print ISBN: 978-1-78262-448-6



*California Local Section has been selected as a finalist for the
following ChemLuminary Awards*

Best New Public Relations Program of a Local Section
Outstanding Continuing Public Relations Program of a Local Section

Earth Day Celebration at the John Muir National Historic Site

“Members of the California Section returned for the annual festival at the John Muir National Historic Site, a full day celebration of Earth Day in Martinez, CA. This year the festival fell on April 22nd, the date of the original Earth Day in 1970, and the birthday of the great naturalist John Muir. A procession led by bagpipers and John Muir (represented by Frank Helling of the Park Service), followed by many of the exhibitors, opened the event. As Master of Ceremonies, chemist Igor Skaredoff introduced several speakers, musical ensembles, a silent auction, and the presentation of the 40th annual John Muir Conservation Awards that recognized the work of several groups. The public explored the park and visited over fifty exhibit booths on environmental conservation issues. Many hundreds of people attended the event.” The Cal ACS booth featured this year’s Earth Day theme, “Chemistry Helps Feed The World.” Visitors to the booth could try out the Starch

an iodine solution that reacts with the starch found in ordinary paper (but not in the special, cloth-based paper used to print money).

Also popular with both children and adults was Plants Aromas and Molecule Building, presented by Cal ACS Chair-Elect Greti Séquin. Visitors were challenged to identify plant essences and then to build molecular models of key aroma compounds, using the popular MolyMod plastic model kits. Several youngsters remembered our activity from previous years and made it a point to visit us again.

Through their energy and enthusiasm, Cal ACS members Sheila Kanodia, Alex Madonik, Elaine Yamaguchi, and Greti Séquin, in addition to volunteers from UC Berkeley (Juliette Verhaegan and Pawel Misztal) helped make the event a success, interacting with a constant stream of visitors of all ages. We were even helped by the young daughters of one of our volunteers, who were taking the molecular models apart again after visitors were done with them. Our volunteers wore “Exploring Our World Through Chemistry” tee shirts provided by the ACS, and the Cal ACS booth displayed banners and Earth Day balloons featuring the ACS logo and tagline, “Chemistry for



Search, an activity that revealed the starch content of foods such as pasta and crackers using counterfeit currency detection pens that can be purchased in most office supply stores. These inexpensive markers contain



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Toxic Terra Part 10

Bill Motzer

In Part 9 of this series (March 2017 Vortex), I discussed natural (geogenic) chromium-6 [Cr(VI)] formation in California's groundwater.

In 2014, because of the possible carcinogenic concern's with Cr(VI) ingestion, California established a drinking water primary maximum contaminant level (MCL) of 10 µg/L or parts per billion (ppb). (Note: as of May 5, 2017, this MCL was set aside by a Sacramento Superior Court's decision siding with the plaintiff that the State Water Resource Control Board (SWRCB) had not taken economic considerations into account when establishing this MCL. Therefore, until a final decision is made the total Cr primary MCL of 50 µg/L will be used by water suppliers.)

Most naturally occurring Cr in source rocks exists as Cr(III) minerals (e.g., chromite:

FeCr_2O_4) of which many are relatively water insoluble. For example, under standard conditions (at 25°C and 1.0 bar atmospheric pressure), in the chromium-oxygen-hydrogen system as shown in Figure 1, the Cr(III) stability zone occurs over a wide Eh and pH field under both reducing to oxidizing and acid to alkaline conditions. In the Figure 1 example, Cr(III) generally forms insoluble

chromic oxide (Cr_2O_3), from about pH 5.0 to 13.5 and from an ~Eh ranging from +0.8 to -0.75 volts (V). However, at slightly less than pH 5.0, Cr_2O_3 can dissolve forming soluble chromium hydroxide (CrOH^{2+}). At a pH of approximately greater than 13.5 and an Eh ranging from 0.05 to -0.8 V, the soluble Cr(III) anion (CrO_2^-) forms. In aqueous environments under low Eh conditions, the main Cr(III) species are the Cr(III) cations (Cr^{3+}) and CrOH^{2+} .

In another Eh-pH diagram (Figure 2) for the chromium-water-oxygen system under standard conditions that could predominate in groundwater, soluble chromium cations and anions may be produced from insoluble Cr(III) hydroxide. Concentrations could range from 500 µg/L to 5,000 µg/L. However, under most natural groundwater conditions, such concentrations are rarely found generally not exceeding the primary MCL) of 50 µg/L for total Cr.

Note in both Figures 1 and 2 that the Cr(VI) stability zone or field occurs over a much narrower range than the Cr(III)

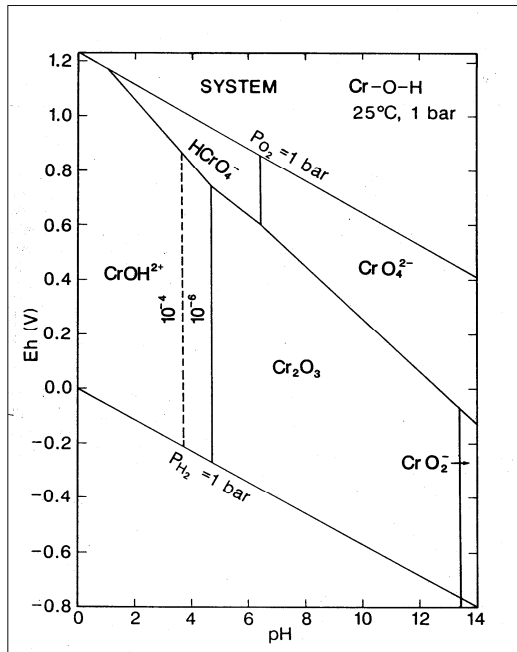


Figure 1: Stability zones under different Eh-pH conditions for the Cr-O-H system.

stability field. Cr(VI) species primarily occur under oxidizing (+Eh) and alkaline conditions (pH >6.0). In this field, Cr(VI) generally forms soluble chromate (CrO_4^{2-}) anions from approximately pH 6.0 to 14.0 and at an Eh from approximately -0.1 to +0.9 V. How and why this occurs will be discussed in my next article on this topic.

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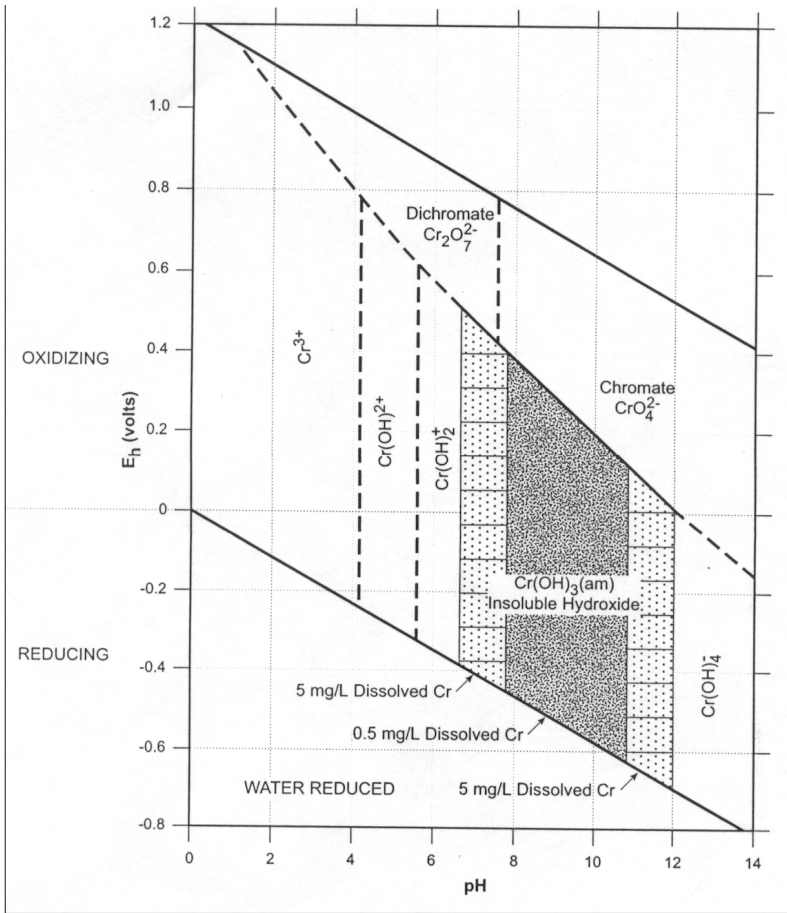


Figure 2: Stability zones showing possible amounts of dissolved soluble Cr(III) in water.



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the seasons and fireworks.

Uncle Tungsten: Memories of a Chemical Boyhood (Oliver Sacks): You might call this a boyhood autobiography by the author of The Man who Mistook His wife for a Hat and Awakenings. It might bring back memories of family members with eccentricities (or make you reflect on your own.) The Elements: A Visual Exploration of

Every Known Atom in the Universe (Theodore Gray): this would be a great coffee-table book. It is visually stunning and the fascinating for that aspect alone. But the captions and text make it much more than just a picture-book.

If you have others to suggest, pass them along.



National Chemical Landmark Dedication .

On May 15 the ACS honored the late George C. Pimentel and Kenneth Herr, and their team, at UC Berkeley's College of Chemistry and Space Science Laboratory for the Mars InfraRed Spectrometer. The instruments flew past Mars in 1969 aboard Mariner 6 and 7. This is the fifth National Chemical Landmark within the CALACS Section due in a large part to the effort of Attila Pavlath to bring the appropriate information to the attention of ACS,

The other four landmarks are room 307 of Gilman Hall at UCB (commemorating the discovery of plutonium by Glenn T. Seaborg and his coworkers, the Lawrence Berkeley National Laboratory (site of the development/discovery of many trans-uranium elements), and two at the USDA's Agricultural Research Service Western Research Center in Albany (one for its research on the quality and stability of frozen foods and another for research in the area of flavor chemistry and advances in analytical chemistry.)



Attila Pavlath presenting the plaque to
Jeanne Pimentel



Awards Meeting Report

The Section is honored each year to acknowledge our Members with 50 and more years of



ACS service. In addition to the 50, 60, and 70 year anniversaries, there was a 76 year member. The Section acknowledged the following recipients: Robert Fabini-Ryland High School Teacher Award, Mark Frishberg-Peterson Award, and Eileen Nottoli-P3 Award



Women Chemists Support Sonoma County's Expanding Your Horizon Conference

Janet Schunk

On Saturday, April 1, 2017, approximately 195 6th to 8th grade girls converged on the campus of Santa Rosa Junior College, this year's host site for Expanding Your Horizon (EYH) in Sonoma County. The EYH conference is designed to expose young women to careers in science, technology, engineering, and math (STEM) by allowing them to attend three hands-on workshops of their choice. Workshops ranged from aviation, robotics programming, environmental chemistry, investing, and mechanical engineering.

Janet Schunk and Anne Taylor, from the California Section of the Women Chemists Committee, presented three, 50-minute chemistry workshops, using paper chromatography and incorporating design of experiments (DOE) to demonstrate principles and techniques used in chemistry. Anne and I started the workshop by providing a brief background about our educational and work history, allowing the girls to see that a STEM background can be a solid foundation for multiple career options over time. We emphasized that continuous learning is key to job changes over the course of their career, which may include taking a "pause" to start and raise a family.

Our workshop focused on paper chromatography, a technique to separate mixtures often used by chemists in real life. We introduced the girls to terms such as mixture and mobile and stationary

phases. Separating mixtures may sound dull, but we spiced it up by using "design of experiment". This year, we used a multi-factorial design, where the girls needed to be collaborators. The design involved using two different brands of paper towels (different fiber weaves for the stationary phase), two different "age" of water-soluble black markers (old vs. new Mr. Sketchy black markers), and two different sample sizes (line vs. dot), to determine a) what color is black as well as if the formulation changed over 15 years, b) does the sample size influence how well the components separate, and c) does the stationary phase affect the separation.

Even though each girl performed the design of one Collaborator, they needed to look at the results across all four collaborators (A, B, C, D) to answer the three questions. They found that the two brands of paper towel did impact the separation; there was some difference seen in the age of the markers, but no fundamental difference in the formulation; and using less sample (dot) seemed to have provided better separation than using more sample (line).

This annual trek to Sonoma County to support their Expanding Your Horizon Conference has been a part of the Women Chemists' Committee contribution to the California Section's Strategic Plan Goal 3, fostering excellence in chemical education, for over 10 years.



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Life." The ACS-endorsed March for Science logo was also on display.

Mild temperatures on a sunny day helped us reach out to the public with eco-friendly chemistry activities. Our participation in this annual event continues to build a positive image of chemistry and of science in

general, while making new connections with East Bay educators and organizations.

Sheila Kanodia (Earth Day Coordinator) and Alex Madonik (National Chemistry Week Coordinator)



March For Science

Lou Rigali

The March for Science on April 22 in Berkeley was organized independently by UC students, but the basic theme supported by marches all over the world, was the same. Science matters and facts, not alternative facts are important. The event included inspirational talks before the march then the crowd, noisy but peaceful, wound through campus and onto the city streets with lots of clever worded signs. I liked the one with an arrow pointing to the earth saying, “I’m with her.”

The talks were by UC professors, postdocs and graduate students, each indicating why science was important to them but emphasizing that Science touches us all, from our phone to our health.

There is an assault on Science as evidenced by powerful politicians and corporations with their denial of climate change and the defunding of scientific programs that protect the environment and support basic and medical research.

The Key question is what comes next in the defense of Science. It is perceived by the general public that scientists are apolitical or at least want to refrain in a public way

from “political issues.” Public detachment may not be in the best interest of Science, and it may never have been. Driving a hybrid, or composting is not enough.

If one believes that science is showing that climate change is going to have destructive consequences for most of us and that it is already too late for some corrective measures we still need the best science and technology to mitigate the forthcoming problems. It is a fact that the major fossil fuel corporations and those whose profit from that industry have for years supported misleading claims. This was essential in helping to cast doubt into the minds of many who for whatever reasons need to believe those spurious allegations. It is also a fact that much of our media; newspapers and television, are owed or behold to climate change deniers and thus are complicit in the support and dissemination of these alternative facts.

There are powerful backers of alternative facts and it will take active broad-based coalitions by US and our neighbors to develop a coherent strategy and implementation plan to reverse the anti-science programs. Many of our neighbors are involved in community affairs. Find out about them, and join if you want someone to support your cause, help support theirs.



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- Hospitals for technical and research personnel

There are several web sites that may help you search for these open positions.

- www.mboservices.net
- <http://www.calacs.org/page.asp?id=22>

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