

# THE VORTEX

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CALIFORNIA SECTION  
DECEMBER 2013



Family Science Night at Thornton Junior High School, Fremont CA October 2013

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## *New Section Store*

Why is the Section opening a store? In his Chair's message this month Wally Yokoyama gave a summary of some of the educational and community outreach programs that the Section organized in 2013 to inspire students and the community-at-large about science. This is in addition to the monthly technical programs at the monthly section meetings and by the Women Chemists Committee. Retirees and students attending the technical programs are supported however, all the outreach programs are funded entirely by the Section. The money to support these programs comes from section dues, allocations from the National ACS, and previously submitted and awarded grants, usually from National ACS.

A short digression regarding local section dues may be relevant. Dues to the local section are 100% voluntary. Every year when Members pay their National ACS dues they have an opportunity to check a box on the form indicating their interest to voluntarily contribute to the Section (dues).

The fact is that about 1/3 of the members check that box. The question does arise, why do about 2500 members not check the box? I cannot help but speculate. Other than simply being an oversight, the other somewhat reasonable guesses would be that the member does not know about the technical, educational and community science outreach programs or they may feel that membership in the local section provides insufficient value. If you are one who mistakenly forgot to check that "dues" box, that is easily remedied. Just send a check for \$14 to the Section Office. If there is another reason, let me, Lou Rigali, know and I will see what changes can be made.

For the 2014 budget, there are cutbacks in almost all programs (See the end of this article). For instance, the ACS Program SEED (a summer experience program for economically disadvantaged high school students) started 43 years ago by Dr. Alan Nixon, past-president of the ACS, and the California Section, has had to significantly reduce the number of students that can be accepted into the program in 2014.

We receive letters of appreciation from school teachers recipients of our outreach

# I HAVE CURIE-OSITY



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programs telling us how valuable the experience has been for the children and their families. It is sad if we need to curtail these programs.

The last Family Science Night is an excellent example of the enthusiastic reception and enjoyment that was had by the students, the family members that attended and the teachers. We organize educational, community participation events like this about once a year, It would be nice to do them more often.

The idea of a Section store to sell memorabilia for science events has become a reality. The store is managed by Ardency Inc, dba Quantity Postcards. Products generate a 25-30% profit for the Section. For instance on a \$20 sale the Section gets \$5.00, the cost of the product is \$10, processing and handling costs of about \$2.50 and about \$2.50 profit for Ardency. There are no website or webstore maintenance charges or any other charges to the Section except for the bank credit card handling fees.

We are starting modestly with only two T-shirt designs. We will add a lot more products and would welcome your suggestions and comments on new designs or on any aspect of the store. Custom designs for special events can be produced at a reasonable price. The website is <http://calacs.deco-apparel.com/>

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# THE VORTEX

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## Chair's Message

Wally Yokoyama

Christmas is the season of Hope. We live in the richest country in the world but there are not enough resources for education nor enough emphasis on learning... particularly science. William Butler Yeats said "Education is not the filling of a pail, but the lighting of a fire". I think it is both. Your local ACS section has done a considerable amount of fire lighting this year. At the Middle School level, section volunteers, the PTA and school staff of Bancroft Middle School in San Leandro educated and lit a fire for chemistry under hundreds of students by science demonstrations and hands-on activities. At the High School Level the Section sponsored paid internships through the ACS Project SEED program for 45 students in laboratories around the Bay Area. The students were mentored by volunteer chemists with the permission of their employers and financial support from the local Section. There are also endowments and corporate sponsors such as Chevron and BioRad.

The first Glenn Fuller Award to the outstanding SEED student was presented this year in honor of Dr. Fuller's tireless devotion to the program. Also at the high school level Team USA won two gold and two silver medals at the 45th International Chemistry Olympiad in Moscow, Russia this summer. At the

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community level the Section participated in Earth Day in Martinez, and had a booth at the Solano Stroll in Albany, attended by over a hundred thousand people. There were also events of national and international importance. Dr. Marinda Wu, a California Section member, was President of ACS in 2013. The USDA, Western Regional Research Center, Albany, CA was awarded a second Historic Chemical Landmark award. The only institution in the world with two ACS Landmark awards. The Section also supported the visit of Dr. Sorin Rosca, President of the Romanian Chemical Society, to give a lecture at LBL. I want to thank all the individuals and companies who helped to light fires that will burn throughout a lifetime in children (and adults) by contributing time and money. I want to close with a quote from Benjamin Franklin, "An investment in knowledge pays the best interest".

Happy Holidays.



## Election Results and Section Officers 2014

Chair-elect - Charles Kuchowski

Treasurer - I-Feng W. Guo

Director - Attila Pavlath

Members-at-Large - Margareta Sequin, Igor Sobolev, Daniel Calef

Councilors - Elaine Yamaguchi, Bryan Balazs, Paul Vartanian

Alternate Councilors - Donald Maclean, James Postma, Daniel Calef

THE VORTEX

Join us for a spectacular view:



Join us to view this once-in-a-lifetime astronomical event!  
Drop by with family and friends to view the spectacular passage of ISON  
as it travels through the inner solar system. Comet ISON belongs to a  
special category of comets called sungrazers, and is anticipated to be a  
brilliant object potentially 10 times brighter than Venus.  
Some say it could even put the full moon to shame!

**This unforgettable event will include these not-to-be-missed activities:**

- Professional & amateur astronomers will be on hand with telescopes and super cool viewing glasses
- Saint Mary's professor and astronomer Dr. Ron Olowin will also be in the amphitheater to discuss the significance of this event and how it relates to astronomy through the ages
- Fun comet craft for the kids
- Special tasty treat for the first 70 attendees!



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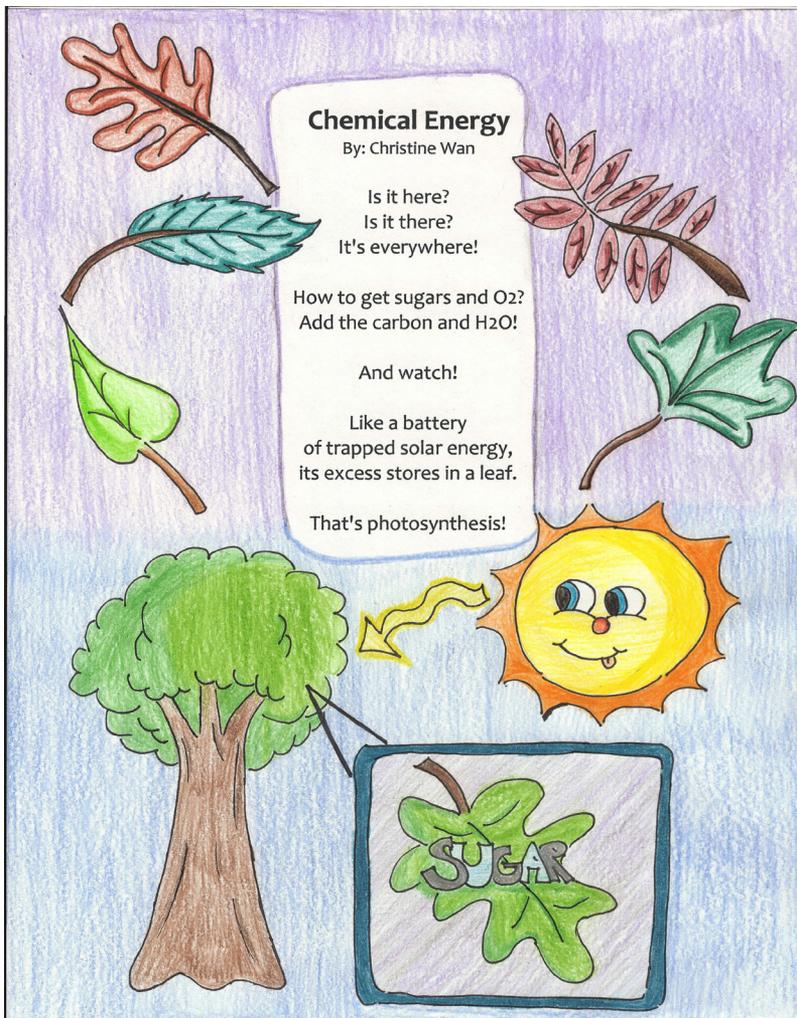


### *Section Meeting*

There is no Section Meeting in December. The officers of the Section, members of the Executive Committee, the Board of Trustees, the staff and editor of the Vortex, wish for you and yours a joyful Holiday Season.

## National Chemistry Week Illustrated Poem Contest

A total of 50 entries were received for the National Chemistry Week Illustrated Poem Contest, mostly from seventh grade students. Greti Séquin, Charlie Gluchowski, and Alex Madonik selected a winner: Christine Wan. Christine's entry was also submitted to the national ACS contest. There are prizes for Christine Wan, for Jerry Hu (runner-up), and for Christine Li and Allyson Yang (honorable



Christine Wan, winner of the National Chemistry Week Poetry contest

(Continued on page 8)



## Saluting Stable Isotopes (Part I)

Bill Motzer

The excellent recent article on Mass Spec's Century of Change (Chemical & Engineering News, v. 91, n. 42, pp. 30-31) noted that back in October 1913 this analytical technique didn't particularly interest chemists at first. However, it prompted them to seriously explore the periodic table. When I began investigations in forensic geochemistry about 15 years ago, only university laboratories were fully capable of providing isotope ratio mass spectrographic analysis. Now there are several excellent commercial isotope labs generally providing light isotope (Tier 1 and 2) analyses. Over the past decade and a half there has been a considerable increase in studies using stable isotopes to fingerprint different substances, particularly for solute and water sources. Stable isotope analyses are generally provided as isotopic ratios of the particular element being analyzed (e.g., oxygen-16 and oxygen-18 in water). Generally, the concentrations of a particular isotope may change, but the ratio of the different isotopes remains the same for that substance from a particular source.

By established convention, isotopic ratios are defined in delta ( $\delta$ ) notation. The  $\delta$  value, in per mills (‰), can be obtained by the equation:

$$\delta \text{ (isotope)} = \frac{[R(\text{sample}) - R(\text{standard})]}{R(\text{standard})} \times 1,000$$

where:  $\delta$  (isotope) = values in per thousand (‰) or per mill and

$R(\text{sample})$  = the ratio of the first and second isotope such as 18O/16O, and

$R(\text{standard})$  = the ratio of 18O/16O used in an international or other standard.

A commonly used standard for 18O/16O is Standard Mean Ocean Water (SMOW). A  $\delta$  value with a positive (+) sign corresponds to an increase of the first isotope (e.g. 18O) with respect to the standard indicating that the sample is enriched with the heavier isotope. A minus (-) sign indicates a decrease in a sample with respect to the standard indicat-

ing that the sample is depleted with respect to the heavier isotope. The International Atomic Energy Agency (IAEA) and the National Institute of Standards and Technology (NIST) have established such standards.

### Oxygen and Hydrogen (Deuterium) Stable Isotopes in Water

In the past decade, water isotope hydrology (particularly isotopes of 16O, 17O 18O, H, 2H, and 3H) has become useful for determining groundwater sources, exchange of solutes (between groundwater and lakes), direction of groundwater flow, residence time, and other hydrologic conditions (such as flow paths and static head measurement).

Water, composed of oxygen and hydrogen (H<sub>2</sub>O), contains isotopes of oxygen, mostly as 16O (99.76%) and 18O (0.20%) and hydrogen, as hydronium (1H) (99.985%) and deuterium (D or 2H) (0.015%). Water that is largely composed of 16O is less dense ("lighter") than water with a larger component of 18O. Because water evaporation is temperature dependent, it condenses at different rates for different latitudes and climates (see map of North America); its atmospheric condensation is also temperature-dependent and, therefore the ratio of 18O/16O in rain and snow will change with latitude and elevation. The higher the latitude or the elevation, the lower the  $\delta$ 18O values, which vary from approximately 0‰ at the equator to about -55‰ (in comparison to Standard Mean Ocean Water or SMOW) at the poles. The same is true for hydrogen and deuterium; for example, deuterium ratios are also directly proportional to 18O/16O ratio fractionation.

A plot\* of the  $\delta$ 18O concentration versus the  $\delta$ D (2H/1H) will show unique characteristics for water samples collected from different latitudes, climates, seasons, hydrologic basins, and hot springs. In general, this relationship can be plotted as a straight line, known as the "Global Meteoric Water Line (GMWL)"; the slope of this line is represented by the equation:

$$\delta D = (8\delta 18O) + 10$$

(Continued on page 7)

*Isotopes..continued from page 6)*

Deviations from the GMWL occur by the physicochemical processes mentioned above but particularly from evaporation, and from other processes such as  $\text{CO}_2$  and  $\text{H}_2\text{S}$ -exchange reactions, and methanogenesis. Local variations also occur and local meteoric water lines (MWLs) can be calculated. Another example of stable oxygen-hydrogen isotope use is illustrated with landfill leachate in which a plot of the ratio of  $\delta^{18}\text{O}$  versus the  $\delta^2\text{H}$  shows that the  $\delta^2\text{H}$  in leachate is larger than that in SMOW and in comparison to natural background groundwater, because of methane production in the landfill. Therefore, the  $\delta^{18}\text{O}$  versus the  $\delta^2\text{H}$  plot is useful in identifying or tagging landfill leachate.

In summary,  $\delta^{18}\text{O}$  and  $\delta\text{D}$  plots\* may be used to define both natural and contaminant groundwater sources. However, because fractionation so readily occurs in  $\delta^{18}\text{O}$  and  $\delta\text{D}$ , if more than one evaporation source is present, several different evaporative lines may extend from the local MWL. Therefore, it may be difficult to distinguish between different evaporative sources, particularly if the evaporitic sources are very similar.

In future articles we will explore some of the uses for other "light" and "heavier" stable isotopes.

\*Plots are shown in the Vortex on-line version. [www.calacs.org](http://www.calacs.org)



*(Store.. continued from page 2)*

If you would like to contribute to the Section and have no need of a T-shirt or other product, just send a check, made out to the California Section, to the office address on page 3.

Writing about the budget process is boring. However the meetings are most animated. I suggest you attend. Every member can come to any meeting, no charge, a meal (optional) is served at about 6:30 for \$16. Check [www.calacs.org](http://www.calacs.org) for time and place, usually the first Tuesday of the month.

What is most important to know is that all officers, members of the Executive Committee, the Board of Directors and the Board of Trustees volunteer their time and none receive any pay. Only the office manager has a paid position and that amounts to 5 half days each week.

Budgets are discussed and reviewed for about 6-8 weeks and then a budget is presented to the Board of Directors for acceptance. Their decision is final.

Lou Rigali

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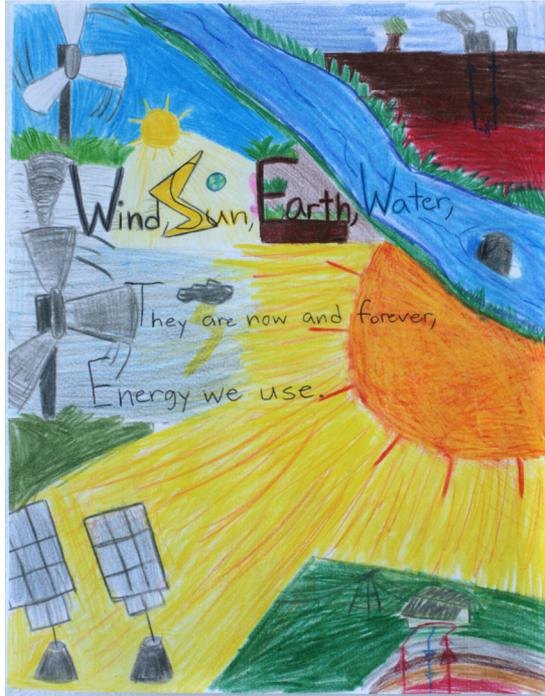
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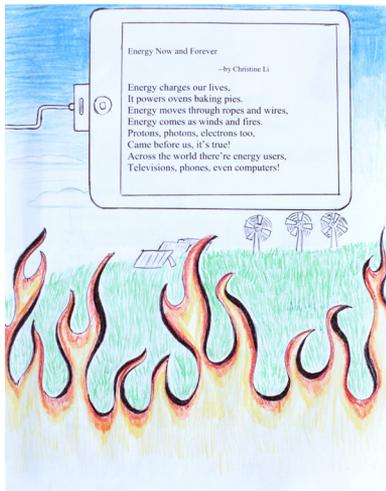
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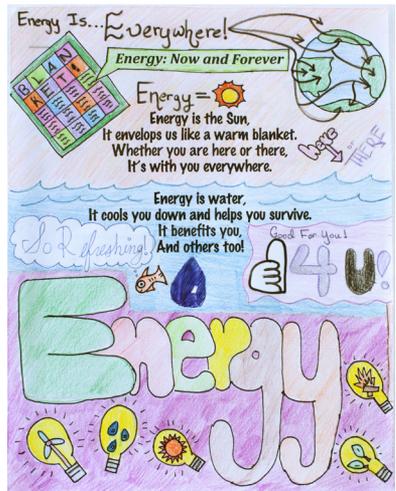
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Jerry Hu (runner-up) National Chemistry Week Poetry contest



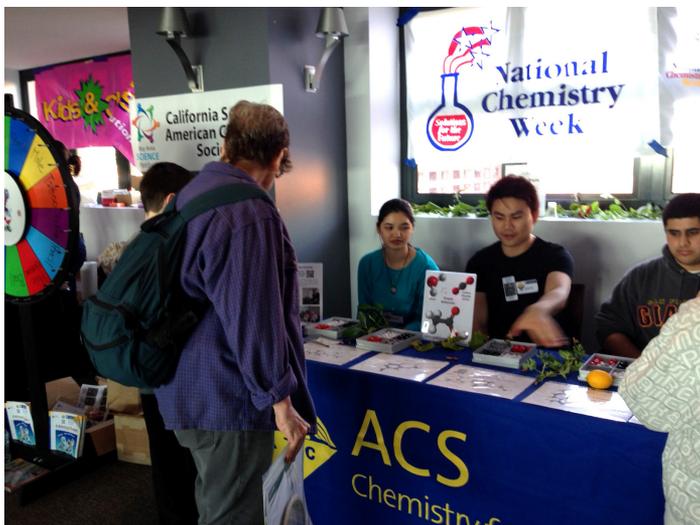
Christine Li (honorable mention)



Allyson Yang (honorable mention)

## *Bay Area Science Fair*

Both the California and Santa Clara Sections participated in Discovery Days at AT&T Park on Saturday November 2, 2013



Volunteers from San Jose State U., San Francisco State U., and Skyline College in San Bruno.



Volunteers from LBNL and Skyline College in San Bruno

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Title: Synthetic Biology

Speaker: Leonard Katz, PhD, Director of Research & Industry Relations at Synberc

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Cost: \$ 5.00 per adult

Syn·the·tic Bi·ol·o·gy noun \ [sin-thet-ik bahy-ol-uh-jee] \ : design or modification of biological systems for useful applications using engineering principles.

What does synthetic biology promise for the future? How is it currently being utilized? What are the risks? The Synthetic Biology Engineering Research Center (Synberc) is a collaboration between UC Berkeley, Stanford, Harvard, MIT and UCSF and is a leader in this industry.

Leonard Katz, PhD, Director of Research & Industry Relations at Synberc, will facilitate a discussion sharing the latest in the field, including biological systems currently under examination such as bacteria, yeasts, mammalian cells and tissues. Join us to explore this important, emerging field.

### *Family Science Night*

We continue to hear favorable comments through Alex Madonik, the Section's event coordinator and Chair of National Chemistry Week. There were well over 1000 participants at Family Math & Science Night, with at least 800 programs printed and given out.

In a meeting with teacher Jess Norling, who led the effort at Thornton, she indicated that favorable comments are still coming in from parents and students alike. And, they

want to do it again. Ai Vu of the Alameda County Office of Education was visiting Thornton during the meeting and she assured Alex that the Alameda County would like to make this event a model for other districts to imitate. Jess emphasized that this event has really stimulated parent participation at Thornton, and Ai Vu considers that result to be a key benefit.



Bonnie Charpentier and Lee Latimer



Thank you cards from Thornton students

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