

# THE VORTEX

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JANUARY 2014



Mark Frishberg, Cal ACS Section Chair 2014 receives the gavel from Wally Yokoyama, Chair 2013

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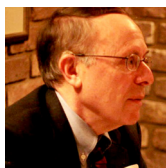
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## Chair's Message

Mark Frishberg

In preparing for this *Vortex* message as the new Chair of CALACS, I could not help thinking how exciting a time it is to be a member of our local section.

I am sure to be leaving some people and activities out, and apologize in advance, but please consider many of our recent results and upcoming events. One of our own, Marinda Wu, has just finished a tremendous year as National ACS President. Another one of our members, Bryan Balazs, while unfortunately not successful, was honored as one of the candidates for ACS President in the most recent election. Lee Latimer and the too-numerous-to-mention contributors who helped with the multiple years of planning and then the exceptional execution of the CAL-ACS and SCV-ACS sponsored 2013 Western Regional Meeting in October should still be basking in the glow of its success. Alex Madonik and his many local section teachers, and student volunteers pulled off a Family Science Night during National Chemistry Week that set records for attendance, at over 1000, and for participation by the staff at Thornton Junior High School in Fremont. Elaine Yamaguchi continued her excellent operation of our section's Project Seed program, as did Sheila Kanodia and our Women Chemists Committee with our Earth

Day celebration. It was great to see the pride on the faces of 2013 Chair, Wally Yokoyama, and ACS Past President and multiple time serving local section Chair, Attila Pavlath, at the ACS Landmark presentation at their long time workplace, USDA/WRRC in Albany, the second ACS Landmark awarded to that organization. And then there was Greti Sequin and her student volunteers at the Bay Area Science Festival-Discovery Days at AT&T Park in November, our participation in the Solano Stroll in September, and the visit by the President of the Romanian Chemical Society at a section meeting and tour of LBNL in April.

Looking ahead, 2014 will be an equally busy year with all of the annual activities continuing, and the ACS National Meeting returning to San Francisco, August 10-14. Some of our visions for the National meeting include an exhibit during the meeting honoring eminent Bay Area scientists, and a public outreach event on Saturday, August 9. With the theme for National Chemistry Week in October being "The Sweet Side of Chemistry - Candy," hopefully we can arrange a tour or two of the several Bay area candy companies, in addition to our Family Science Night. Stay tuned for more information on all of this.

The continuing success of our programs depends on our many dedicated volunteers, and we are always in search of more. Members interested in any of these activities, or who

*(continued on page 9)*

## Save the Date January Section Meeting

At this time we are not able to confirm details for the January Meeting. Our best estimate is Monday, January 27th. Please check the calendar on the website [www.calacs.org](http://www.calacs.org) or call the Section Office, 510-351-9922



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### SCIENCE CAFE: **SYNTHETIC BIOLOGY**



**Tuesday, January 28**

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.

**WHEN: Tuesday, January 28, 2014**

**7:00pm - 8:00pm**

**WHERE: LLLC Community Hall**

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**SCIENCE CAFE:**  
**The Art & Science of 3D Printing**  
**Tuesday, February 25, 2014**



3D Printing, also known as additive manufacturing, is an emerging technology that creates a three-dimensional solid object, of virtually any shape, from a digital model. Brian Palacios, co-founder of Fabricastl, Inc. will present an overview of the technology and how it is becoming a mainstream movement with widespread commercial applications. Attendees will walk away with a broad-spectrum understanding of this science-fiction-like technology and a greater sense of the positive impacts this new era of printing will bring.

**WHEN: Tuesday, February 25, 2014**

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**WHERE: LLLC Community Hall**

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## Saluting Stable Isotopes (Part II)

Bill Motzer

This article continues our examination of the use of stable isotopes in environmental and forensic geochemical investigations (see Part 1 in the December 2013 issue of *The Vortex*). Additional Tier 2 elements that can be used include nitrogen and oxygen isotopes in dissolved nitrate ( $\text{NO}_3^-$ ) and nitrate-containing compounds.

Anthropogenic nitrate pollution is a continuing and increasing environmental concern with sources from septic systems, sanitary sewage effluents, domestic animal wastes, farm and home nitrogen fertilizer applications, explosives and pyrotechnics (i.e., fireworks, flares, torches, and munitions). Such sources have impacted and are continuing to impact surface water and groundwater world-wide. There is also geogenic nitrate, including naturally-occurring nitrate compounds in desert vadose zone soils. In 2003, U.S. Geological Survey (USGS) researchers noted that desert soils contained nitrates in greater concentrations than had been previously reported; they found that subsoil nitrate concentrations ranged from 2,000 to 10,000 kilograms per hectare (kg/ha). In agricultural regions, farmers typically apply nitrogen fertilizers in quantities of only 25 to 250 kg/ha per year. Conclusions from the USGS studies show that desert soils are a naturally-occurring nitrogen reservoir with the potential to mobilize

and leach nitrate into groundwater. Under semi-arid and arid conditions this may not pose a problem because of low precipitation, infiltration, and leaching rates. However, in the western U.S., desert basins and aquifers are being investigated, particularly those in southeastern California where several water agencies intend storing water in subsurface aquifers by allowing it to percolate to the water table from shallow vadose zone wells. For those living in desert areas that depend on groundwater as a potable drinking water source, an understanding of nitrate sources and the processes affecting nitrate concentrations is of critical importance.

Stable nitrogen and oxygen isotopes are useful in determining nitrate sources when present in surface water or groundwater. Delta nitrate-nitrogen ( $\delta^{15}\text{N}_{\text{nitrate}}$ ) and nitrate-oxygen ( $\delta^{18}\text{O}_{\text{nitrate}}$ ) isotope ratios in water are used in identifying nitrate sources and their fate in vadose zone soil and in groundwater (see Part 1 for the definition of  $\delta$ ). Nitrogen has two useful stable isotopes:  $^{14}\text{N}$  (99.63% in abundance) and  $^{15}\text{N}$  (0.37%). The wide difference in isotopic abundance allows for determination of distinctive isotopic signatures, including those from anthropogenic and natural sources. In analyzed samples, the ratio of  $^{15}\text{N}/^{14}\text{N}$  is compared with a standard, which is atmospheric nitrogen to provide a  $\delta^{15}\text{N}$  value. The abundance of  $^{15}\text{N}$  in the atmosphere remains relatively constant because of the inert character of atmospheric nitrogen; this value is fixed at 0.37%, which essentially

*(continued on center page 7)*

Potential Contaminant Source	$\delta^{15}\text{N}$ (‰)	$\delta^{18}\text{O}$ (‰)
Commercial fertilizer	-4 to +4	+18 to +26
Animal or human waste	> +10	-4 to +12
Precipitation	-3	+18 to +60
Organic nitrogen in soil	+4 to +9	+1 to -4

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results in a  $\delta^{15}\text{N}$  of zero.

Nitrogen isotopes also fractionate, largely by biochemical processes. These include:

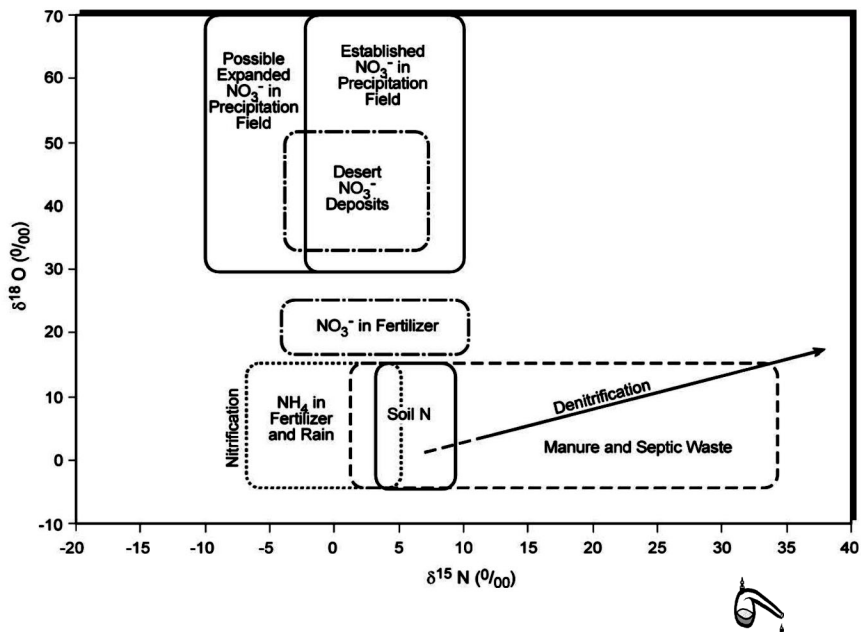
Nitrification in which the ammonium ion ( $\text{NH}_4^+$ ) oxidizes to form nitrite ( $\text{NO}_2^-$ ) and nitrate ( $\text{NO}_3^-$ );

Denitrification, which is the reduction of nitrate to molecular nitrogen ( $\text{N}_2$ ), and

Nitrogen fixation in which dissolved molecular nitrogen is converted to nitro-organic

compounds.

Nitrogen in microbially produced nitrate derived from N species in soil (e.g.,  $\text{NH}_4^+$ ,  $\text{NO}_2^-$ ,  $\text{N}_2\text{O}$ ) or  $\text{N}_2$  from the atmosphere typically has a  $\delta^{15}\text{N}$  value somewhat above zero. The lighter nitrogen isotope ( $^{14}\text{N}$ ) is more easily fractionated resulting in more positive  $\delta^{15}\text{N}$  values. Known ranges of  $\delta^{15}\text{N}$  and  $\delta^{18}\text{O}$  in dissolved nitrate from different sources have been published as noted in the table below.



## 247th ACS National Meeting & Exposition, March 16-20, 2014

Housing and attendee registration for the Spring 2014 ACS National Meeting is open. This meeting's theme, "Chemistry and Materials for Energy," will explore how chemistry can provide solutions to the world's growing energy demands. You can download a list of division technical symposia supporting the theme in PDF format.

Visit the Dallas meeting website and review the registration process and fees, and check out the interesting and highly anticipated Kavli Lecture Series. For a full listing of division symposia, please visit the ACS Program & Abstract Creation System and browse Technical Programming by Division.

Get all the latest details on the Dallas meeting website at [www.acs.org/dallas2014](http://www.acs.org/dallas2014).



## *A simple rule for food safety, if you are unsure, then don't eat it.*

You may have guessed, correctly, that this article is going to involve Genetically Modified (GM) foods. It is not just that tampering with our basic food supply is disconcerting, but also the seemingly shoulder shrugging acceptance of corruption commonplace amongst politicians, corporations and people with wealth.

There was a news item last September concerning the decision of Elsevier, Inc, publisher of the *Journal of Food and Chemical Toxicology* to retract a paper using as the excuse that the study was inconclusive; a reason never before given for any peer reviewed paper. The study in question by Gilles-Eric Seralini *et al* (2012) found that rats fed Monsanto GMO corn and glyphosate-contaminated water developed tumors and other abnormalities leading to earlier morbidity compared to a control group fed non-GMO corn.

Why did Elsevier retract the paper? As soon as the paper appeared on the internet, there were letters from a number of scientists demanding the publisher retract the paper arguing that the study was fraudulent, used incorrect statistical analyses and the wrong type of rats or not enough rats. Significantly an earlier paper by Monsanto using the same kind of rats and experimental protocol found that the GM product was safe.

Subsequent investigative reporting found those first early letters were written by scientists allegedly associated with Monsanto. A research company published on their website a host of defamatory statements about the Seralini study. This company did no laboratory research and the computers that were used to host the website were allegedly connected to Monsanto.

Who is this Monsanto, and who has given them the right to corrupt a proven peer review process to influence a publisher? The story makes interesting reading especially the many letters directed to Elsevier objecting to the retraction. These were written on academic or private company letterheads by well known scientists many of whom are committed to GMOs. A Google search on Seralini will provide all sides of the story.

Of course corruption is not limited to

Pharma and may indeed be more pervasive with our elected officials. That topic is best left to other media, but then again, maybe power and wealth have been able to corrupt them too, you think?

The lack of effective independent testing on the safety of GMOs is often addressed as either not necessary or just too difficult to prove a negative. This is just spin by the major someones like Monsanto and others who have a history of suppressing or marginalizing studies that publish on the safety of GMOs.

Another such example is the work of Chapela and Quist, UC Berkeley professors who published their study in *Nature* in 2001 on the presence of transgenic DNA constructs in native maize in Oaxaca. This work was made controversial because *Nature*, not the reviewers of the paper, added a note saying there was insufficient evidence to justify the original publication. But that is not yet the end of the story. In 2009, E R Álvarez-Buylla, *et al* published in *Molecular Ecology*, confirming the presence of transgenes in three of 23 localities sampled in the 2001 [Chapela and Quist] paper.

Jose Sarukhán, a biologist at the UNAM and a member of the US National Academy of Sciences, recommended the Álvarez-Buylla article for publication in the Proceedings of the National Academy of Sciences. It was rejected. In a letter to the authors the journal's editor-in-chief Randy Schekman, a professor at the UC Berkeley, wrote that the biology and genetics didn't warrant publication, and that a reviewer had pointed out the report could "gain undue exposure in the press due to a political or other environmental agenda". Sarukhán responded, "I saw no reason why it should not be published."

The Álvarez-Buylla work however does not confirm an important conclusion from the original *Nature* paper, whether the transgenes had been integrated into landrace genomes and passed along to progeny plants. Álvarez-Buylla suspects this may be the case, but she is not interested in pursuing another round of politically charged battles, and will leave that work to others.

Lou Rigali



## *Women Chemists go to the New Exploratorium*

E. S. Yamaguchi and S. W. Yeh

On November 16, women chemists met at the new San Francisco Exploratorium, located on Pier 15 along the Embarcadero. This meeting was organized by Drs. Sylvia Hua and Sheila Yeh and consisted of a presentation on the Exploratorium history, its founding and extended reach by Associate Director of Development Lauren Thornhill. This was followed by a tour of Lauren's favorite exhibits.

We also had free time to spend on our own and wander through many exhibits like.

Human Phenomena--Experiment with thoughts, feelings, and social behavior

Getting Started---Awaken your curiosity with open-ended exploration

Tinkering--Think with your hands--a favorite with young children

Seeing and Listening--Experiment with light, vision, sound and hearing

Explore the Environment--Open your senses to this place by the Bay

Living Systems --Investigate the living world

Modeling Landscapes--Explore the local environment

This is clearly a place to come back to over and over again.

The Exploratorium was started by Dr. Frank

Oppenheimer after WW II. His goal was to make science accessible to the public and believed that these exhibits, all conceived by like-minded individuals, would meet his goal. There is a gigantic, open-air Exhibit Development Workshop right in the middle of the Exploratorium, where development, changes, and repairs are made. Of course favorites such as the cow's eye exhibit still have a place in this new site, and the Living Systems area also allows one to investigate plankton from the nearby Bay with ease.

Becoming a high school volunteer in the museum's Explainer Program is very competitive. It seems that the student volunteer needs to be able to assist the visitor in exploring all aspects of a particular exhibit if and when the viewer wants assistance. Training is provided.

Many school groups visit the Exploratorium, and Exploratorium staff visit schools throughout the year. Interaction with middle school teachers occurs in a 2-week, on-site, intensive program in the summer. It is a nationwide program that teaches inexpensive ways to convey scientific principles to their students. It, too, is highly competitive.

This was the final WCC program for 2013, and we thank all who made the programs possible. Stay tuned for future announce-

*(Continued from page 3)*

have new programs to suggest, are invited to contact me (mfrishberg@gmail.com or 707-322-3035), or an appropriate committee member, as shown on our website. And we are always looking to identify new speakers for our local section meetings, and for dinner meeting venues with reasonably priced meals (preferably under \$25-\$30).

In upcoming "Chair Messages" I will discuss the personal value to be obtained by volunteering for ACS activities, and present a primer for how to attend and get the most out of a National ACS meeting.

Finally, it should be mentioned that CALACS needs to find ways to keep up its impressive list of programs during a tightening budget period which will see our



allotment from ACS National dues reduced because of the new ACS calculator governing their distribution. Members are encouraged to choose to pay their voluntary local section dues when their membership renewal comes up, in order to help us make up for this shortfall, or else donate monies to help support specific programs. For example, one very hard decision that we had to make for the 2014 annual budget was to cut back on our local section contribution to Project Seed, and it would be great if we could find a way to make up those several thousand dollars.



### 3rd Annual Flame Challenge Asks, "What is Color?"



The Flame Challenge, which dares scientists to explain a fundamental scientific question in a way that 11-year-olds can understand, is accepting entries for its 2014 competition.

The Flame Challenge is a project of the Alan Alda Center for Communicating Science at Stony Brook University, and it's co-sponsored by ACS and AAAS.

This year's Flame Challenge question is, "What is Color?" Entries are due March

1, 2014. The 11-year-old judges will select winners in two categories – written and visual. Winners will meet actor and science activist Alan Alda and receive a trip to the World Science Festival in New York City. Last year, ACS member Steven Maguire won the visual category.

Visit the Flame Challenge web site, (<http://www.centerforcommunicatingscience.org/the-flame-challenge-2/what-is-color/>) for complete contest details, information about how teachers can register their classes as contest judges, inspirational messages from Alan Alda, and more!



### *Rare Earth Research Conference*

The 27th Rare Earth Research Conference (RERC) will take place at The Village at Squaw Valley in beautiful Olympic Valley, CA, the site of the 1960 Winter Olympic Games, between June 22 and 26, 2014.

Research in the area of the Rare Earths spans several disciplines and brings together chemists, physicists, materials scientists and engineers. The RERC is the venue of choice on the North American continent for scientists from all over the world to present their work and discuss the latest in f element research.

Symposium areas will include Critical Materials, Catalysis, Industrial and Technological Applications; Solid State Chemistry and Physics, Magnetism, and Spectroscopy; Organometallics, Coordination Chemistry and Polymers; Bioanalysis and Medical Applications; Actinide Chemistry and Physics; and Theory of 4f Elements. The conference will feature five plenary lectures, along with several oral and poster sessions. Also, the Frank H. Spedding Award - conferred for "outstanding contributions to science and technology of the Rare Earths," in honor of Frank H. Spedding, a pioneer in rare-earth chemistry and spectroscopy - will be presented during this conference.

Abstract submission is currently open and will close on April 25, 2014. Details on the conference can be found at [www.unr.edu/rerc](http://www.unr.edu/rerc).

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