

# THE VORTEX

AMERICAN CHEMICAL SOCIETY  
VOLUME LXXIX NUMBER 3

CALIFORNIA SECTION  
MARCH 2017



This sign was one of many at a rally by hundreds of scientists and supporters gathered in Boston's Copley Square against the perceived war on science by President Donald Trump.

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*Chemistry and Engineering Speed Networking by ACS and AIChE*

*Date and Time: Mon, March 6, 2017*

*7:00 PM – 9:00 PM PST*

*Location: 775 Tan Hall, UC Berkeley College of Chemistry*

*Register at: <https://acs-aiche-speed-networking-2017.eventbrite.com>*

**What information or advice would you have loved to have received as a student?  
This is our chance to volunteer to pass that advice on.**

YCC is partnering with the student ACS and AIChE sections at Berkeley to host the second annual speed networking event. Last year we had about 60 students and 30 professionals. We hope to beat those numbers this year.

We do make it clear to the students that there is no guarantee that jobs or internships are available. This is purely informative. However, if you are hiring, it's an easy place to get a first look at this spring's graduating class.

There will be opportunities to mingle with other professionals as well. Hopefully you can join us. If you can't make it, please pass the registration link on to anyone else you think might be interested. All are welcome.

This is your opportunity to introduce yourself to the Bay Area network of Chemistry and Chemical Engineering professionals. The California Younger Chemists Committee (YCC), part of the American Chemical Society, is hosting a “speed dating” networking session. The YCC has recruited professionals who are interested in meeting with students. We guarantee individual interaction with at least ten professionals eager to connect with Berkeley undergraduates. There will be advice about internships and scholarships, as well as an insider perspective on careers in industry. There will be both one-on-one time interactions, as well as a mixer for group interactions, to make sure everyone can meet with the people whose careers most interest them. This event is specifically for you: it is a chance to meet professionals in your field and make a lasting impression in a situation more comfortable than an interview or phone call. Get your business cards ready, and we hope you will join us for an evening of new friendships, intriguing discussions, and boundless possibilities.

#### Younger Chemist Committee, ACS California

Organizer of Chemistry and Engineering Speed Networking by ACS, AIChE, and the Younger Chemists Committee of California strives to accelerate the careers of Chemists and Chemical Engineers between the ages of 17 and 35 by providing navigational resources such as mentoring and career counseling. As a committee of the California American Chemical Society, YCC California utilizes its deep connections in industry and academics to host a broad range of networking and educational events. The programming is tailored for our membership, which includes undergraduates, graduate students, postdocs, and professionals. These events provide an unparalleled advantage not only in launching a successful career, but also advancing an existing one. California YCC additionally encourages its members to volunteer in the science and education programming California ACS provides to Bay Area schools.



# THE VORTEX

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### *Chair's Message*

The California Section is humming with more activity than usual as we prepare to host (along with the Santa Clara Valley Section) the National Meeting of the ACS in San Francisco next month. Typically, over 10% of the ACS membership attends a meeting on the west coast, so it is an excellent opportunity to explore the numerous aspects of the ACS and to get a sense of the scope of the chemical enterprise in the U.S. and internationally.



It is a great chance to get to know the Section a bit more as well as the national ACS. Volunteers, including members of our executive committee along with SCV section volunteers, will be staffing a Welcome Booth in the lobby of the Moscone Center. Volunteers from our two sections will be demonstrating chemical activities at the Exploratorium on Saturday, 4/1, from noon until 4 p.m. This event is an ACS Presidential Outreach Event titled "Exploring Our World through Chemistry" which is sponsored by the Committee on Community Activities (CCA). It would also be a great opportunity to visit the Exploratorium at its new Pier 15 location.

Unless you are looking for a job or are looking to hire employees, you may not be aware of the significant activities of the Career Fairs that occur at each national meeting. You will find sessions on the practical tools of resume writing and interview strategies; you can explore chemical career pathways whether you are just finishing a degree or considering a change in your own trajectory. Professional development courses are also available, as is information on internships, salaries, and members' experiences with unconventional chemical careers.

One-third of the attendees are likely to be students, both graduates and undergrads. Some are there to present their research, some for the Sci-Mix on Monday night that focuses on the ACS's student chapters, and some for job interviews and employment issues.

I highlight these areas: community outreach, careers, and students, as they illustrate the dominant activities of the Section and thus exemplify activities that you might wish to become involved. I encourage you to come to the National Meeting in April, while the travel commitment is light (if there is such a thing in the Bay Area.) Be sure to introduce yourself and explore a rewarding role for yourself in the Section.



## *Family Science Night*

Family Science Night returns to Helms Middle School in San Pablo, CA on Thursday, March 9th, 6 PM to 8 PM. The Scientific Jam band and Bryan Balazs will be there to open the show with music and some thrilling chemical demonstrations. Students and their families will discover a dozen or more hands-on activities, and that's where we could use your help. Whether you are an experienced outreach volunteer, or curious to see one of these events for the first time, you can join the fun and also share your love of chemistry with the public. To volunteer, please contact Alex Madonik at 510-872-0528 or [alexmadonik@sonic.net](mailto:alexmadonik@sonic.net)

## *Celebrate Earth Day with the ACS “Chemistry Helps Feed the World”*

We're off to an early start with public outreach in the California Section this spring and you can help!

The California Section returns to the John Muir National Historic Site in Martinez, CA. for this year's celebration of Earth Day (and John Muir's birthday) on Saturday, April 22nd, 2017, 10 AM to 4 PM. We will join dozens of other community groups to share ideas, souvenirs, and hands-on activities with hundreds of visitors. At the Cal ACS canopy location, demonstrations and hands-on activities will relate to the ACS Earth Day 2017 theme, “Chemistry Helps Feed the World.” We will have copies of Celebrating Chemistry (in English and Spanish) with activities that families can try at home, as well as Periodic Table wallet cards, UV-Detection cards and other cool souvenirs.

We are looking for volunteers for the April 22nd event. Preferred shifts are from 10-1 PM and 1-4 PM. Please contact [sushila.kanodia@gmail.com](mailto:sushila.kanodia@gmail.com) or [office@calacs.org](mailto:office@calacs.org)

JOHN MUIR NATIONAL HISTORIC SITE  
4202 Alhambra Ave., Martinez, CA 94553  
[<www.nps.gov/jomu/index.htm>](http://www.nps.gov/jomu/index.htm)

Thank you!

## *February Meeting Report*

The CalACS Section's February meeting took place at the Chevron Richmond Technology Center in Richmond, CA. Prof. Taro Amagata presented a captivating talk describing his research group's efforts to use Actinomycetes isolated from marine habitats as sources of leads towards new anticancer agents. A novel screening methodology comprised of two anticancer whole cell screening systems, cytological profiling (CP) and disk diffusion assay (DDA), enabled rapid identification of cytotoxic compounds with excellent solid tumor selectivity, and their molecular targets. SF Bay sediment and other ocean sediments have been found to be excellent sources of novel bacterial strains. High throughput instrumentation has permitted cell-culture based screening of very large numbers of extracts from novel bacterial strains to detect potential anticancer or antibacterial activity. Samples were prepared for LC-MS analysis, followed by high resolution mass spectral



(Continued on page 10)

## March California Section Meeting

### Investigating Plant Terpene Metabolic Diversity for Agricultural and Bioproduct Applications

**Speaker:** Philipp Zerbe, Assistant Professor  
University of California at Davis, Department of Plant Biology.

**Date:** Thursday, March 23, 2017

**Location:** USDA Albany, 800 Buchanan St,

**Time:** Social, light refreshments 6 pm - 6:50 pm;

Talk 7:00 pm to 8:00 pm

**Cost:** \$10 (\$5.00 for students) for light refreshments, Lecture only is free

**Registration:** Contact: [office@calacs.org](mailto:office@calacs.org). Deadline for registration: March 17, 2017.

#### *Abstract:*

Terpenoids form the largest and most diverse metabolite class in plants with essential functions in plant development and ecological interactions. Their various bioactivities offer a rich source for novel pharmaceuticals and other bioproducts, as well as new leads for enhancing stress resistance in food and bioenergy crops. However, a broader industrial application of plant-derived terpenoids remains limited by the narrow taxonomic distribution, low abundance and complex diversity of these metabolites in nature. We established a transcriptomics-enabled gene discovery platform for efficient identification of terpenoid-biosynthetic pathways. Applying this approach to various non-model medicinal, food and bioenergy plants, we could identify more than 60 terpene syntheses and several hundred cytochrome P450-dependent monooxygenase candidates, as key enzymes

in generating terpenoid metabolic diversity. Functional enzyme characterization revealed numerous terpene synthase functions that produce previously hidden terpenoid scaffolds. Combining enzyme discovery with structure-guided protein mutagenesis, we could further re-direct catalytic specificity toward known and novel structures. Building on the modular nature of terpenoid pathways, where catalytically distinct enzymes may function in different combinations to enhance chemical diversity, we develop proof-of-concept microbial and plant-based platforms for the biomanufacture of high-value terpenoid bioproducts.

#### *Biography:*

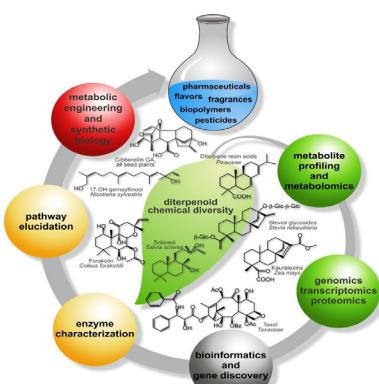
Philipp Zerbe is an Assistant Professor at the Department of Plant Biology, University of California at Davis. His research focuses on the discovery and engineering of specialized



terpenoid metabolism in medicinal plants and food crops for developing tools for the production of terpenoid bioproducts with human benefit. For his research, Dr. Zerbe recently received the 2015 Arthur C. Neish Young

Investigator Award and the 2016/17 Hellman Fellowship. Prior to his position at UC

Davis, Dr. Zerbe received his PhD from the Ruhr-University Bochum, Germany (2007) with emphasis on structural-functional studies in jasmonate biosynthesis, followed by positions as a Postdoctoral Fellow and Research Associate at the University of British Columbia (Vancouver, Canada) where he focused his research on the discovery of terpene metabolic pathways with relevance





## Toxic Terra (Part 9)

Bill Motzer

In Parts 2 through 8 of Toxic Terra, I have discussed the obvious natural contaminants (largely to drinking water resources) of arsenic and fluoride. One so-called “modern” contaminant is chromium(VI) [Cr(VI)], which has been improperly labeled as “hexavalent chromium” (see October 2007 Vortex: Valence Oxidation States).

Cr, including Cr(VI), species occur in California’s groundwater from both an-

thropogenic and geogenic (natural sources). Past investigations largely focused on anthropogenic sources (e.g., added to water as a biocide) popularized by the 2000 movie Erin Brokovich. More recently, groundwater investigations have considered geogenic sources with California having a unique geologic framework, including numerous areas of ultrabasic or ultramafic and serpentinized ultrabasic rocks. These contain abundant Cr and Cr minerals, which when weathered, can undergo transformation in the critical weathering zone to Cr(VI) complex oxyanions. When inhaled these Cr(VI) compounds (largely from anthropogenic sources) are known carcinogens and when ingested (largely from geogenic or natural sources) are suspected carcinogens. Additionally, Cr(VI) serpentine rocks occur throughout the globe (Figure 1) and therefore Cr(VI) compounds may occur worldwide in drinking water sources.

The San Francisco Bay Area has several areas where ultrabasic and serpentinized rocks can be observed, including Mt. Tamalpais and the Ring Mountain Open Space Preserve (RMOSP) in Marin County. In the critical zone, many of the Mt. Tamalpais and RMOSP soil types derived from the underlying serpentine and ultramafic rocks are serpentine soils with unusually high concentrations of iron, chromium, nickel, and cobalt. However these often are deficient in calcium and have low water holding capacities. Such soils can be very stressful

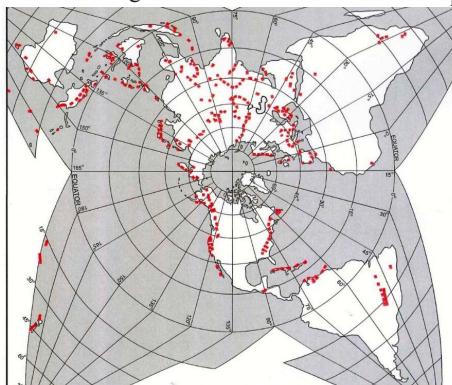


Figure 1: Worldwide distribution of serpentine and ultramafic rocks containing chromium. Modified from Oze, et al. (2007): [www.pnas.org/cgi/doi/10.1073/pnas.0701085104](http://www.pnas.org/cgi/doi/10.1073/pnas.0701085104).



Figure 2: Serpentine barrens on Mt. Tamalpais (Marin County) near Rock Springs. Photo by W.E. Motzer, August 12, 2012.

*(continued on page 9)*

## *The controversy goes on*

Bibiana Campos Seijo

The turmoil that dominated President Donald J. Trump's week one in power has not diminished during week two.

In my previous editorial, I described some of the controversial events that took place during Trump's first week: the Women's March on Washington, the Greenpeace protest, and the nascent idea of a March for Science. Rather than seeing things settling a bit, Trump's second week started with an immigration ban and was followed with, among other events, a vote designed to eliminate transparency of payments made by oil companies working with foreign governments and a leaked e-mail that speculates on the future of the Environmental Protection Agency.

The scientists' march was sparked after reports of a series of mandates curtailing communication from scientists at scientific agencies. The date for the march has been set for Earth Day, April 22, in Washington, D.C. The march is supposed to attract anyone who "champions publicly funded and publicly communicated science as a pillar of human freedom and prosperity," according to the march's mission statement, and so far it looks like there is strong support, with marches being organized in other locations and a following on Twitter in excess of 300,000.

But the event is not without criticism. Some critics feel that a march would further politicize science and drive a greater separation between scientists and media and the public. What are your thoughts on this? Is the March for Science misguided? Given the current environment, some may see it as a necessity.

While this was happening, Trump passed an immigration ban designed to prevent terrorist attacks that prohibits individuals from seven countries from entering the U.S. Opposition came from many areas. In the tech world, giants such as Apple, Amazon, and Expedia are considering or have already initiated legal action against the travel ban.

The American Chemical Society, which publishes C&EN, and 151 other organizations representing a spectrum of

professional societies, national associations, and universities sent a letter to Trump stating that they "are deeply concerned that this executive order will have a negative impact on the ability of scientists ... to enter, or leave from and return to, the United States." Such restrictions, they say, will "reduce U.S. science and engineering output to the detriment of America and Americans."

That is a very real risk, and we may be underestimating the size of the gap in output, which may be greater when you consider not only the number of people directly affected by the ban, but also others who may be indirectly influenced. Besides deterring folks from those seven countries from traveling, the ban may also deter many more in other locations around the world who are fearful that the ban may expand or who will choose not to visit the U.S. based on moral principles. Whatever the case, it is likely that science in Europe and Asia may reap the benefits as alternative destinations for this scientific talent.

And the changes just go on: A few days after the ban was issued, when Rex Tillerson, former Exxon chief executive officer, was confirmed as secretary of state, the House of Representatives voted to eliminate a rule designed to provide transparency of oil and gas companies working abroad. Without the rule, these companies no longer need to disclose any payments, including royalties and taxes, made to foreign governments. And on the day this editorial went to press, an e-mail outlining a plan to dismantle EPA by 2018 was leaked to the Huffington Post.

So I'd like to finish by saying that C&EN will be faithful to our mission and will continue to report fairly and independently just as we have done in the past. Please check our website regularly for the latest news and to learn how these changes affect the chemical sciences.

### Ed Note:

This is a portion of an Editorial by the Editor in Chief of C&EN, Volume 95 Issue 6 | p. 2  
Editor's Page Issue Date: February 6, 2017  
Full article can be found at <http://cen.acs.org/articles/95/i6/controversy-goes.html>



## *March For Science*

Here is information for those who do not know the specifics of the March that is scheduled for Earth Day April 22, 2017. It arose as a grassroots reaction to concerns about the conduct of science under President Donald Trump. Presumably, it was inspired by the Women's March on Washington. The AAAS website has some comments and a list of scientific organizations that are either supporting or considering their options. <http://www.sciencemag.org/news/2017/02/will-they-or-won-t-they-what-science-groups-are-saying-about-joining-march-science>.

This link will help you find a Satellite March closest to you. <https://www.marchforscience.com/satellite-marches/>

There are valid reasons why individuals and organizations will or will not support the March. This article is not intended to change anyone's opinion, but to provide factors to consider for those who have not made up their mind.

The country is much divided. There are those in many sections of the country who were angry at their loss of jobs, loss of hope for a good life for their children and grandchildren, and were upset with how their vision and hopes for America did not seem to be championed by either of the

established political parties. A person who seemed to support their view was elected president. Hopefully that fact will help dissipate some of that anger and common ground can be found.

The electoral votes have been duly counted and the results are as we know. At the same time there were 3 million more votes for the opposing candidate than for the President. Those people were also unhappy and angry. Reality will kick in and that anger will also be dissipated.

Unfortunately, the President continues as if he is still campaigning in the election. His remarks, actions, and events all appear to benefit his supporters. Because it is done in a flamboyant and braggadocio manner, it is insulting to many. Among the groups feeling the pain are those who value facts, truth, and believe in the scientific method. Our President plays fast and loose with facts and is cavalier concerning the consequences of his words and actions. This makes people fearful and fear transitions to hurt and anger.

Protest is one of the ways that Americans demonstrate their values to politicians and leaders. It is also a message of confirmation to each other. There is joy and healing in preaching to the choir.

Lou Rigali

## *Alternative Facts*

The sign shown on the front page was one of many at a rally by hundreds of scientists and supporters gathered in Boston's Copley Square against the perceived war on science by President Donald Trump.

Though the rally was serious in basis, some demonstrators brought signs that used science and math to poke fun at the president.

**253rd American Chemical Society National Meeting & Exposition**

**San Francisco, California  
April 2-6, 2017**

# “Why Should I Believe a Word of This?”

ANDREW FRAKNOI

The following is Dr. Andrew Fraknoi's 2016 commencement address given at Foothill College, where he is an astronomy professor. Fraknoi was awarded the 2007 California Professor of the Year by the Carnegie Foundation for the Advancement of Teaching and the Council for Advancement and Support of Education. He is a fellow of the Committee for Skeptical Inquiry.

Today, I would like to speak to you, as a scientist and an educator, and focus on one theme.

I hope that your time at Foothill College has given you new skills, better information about nature and history, and new enjoyment of the humanities and the arts. But I hope your years with us have been about

When I tell my students that thousands of planets surround the other stars we see in the sky and that a number of those planets are now known to resemble our own Earth in important ways, they have every right to ask, “Why should I believe a word of this?”

When I share with my students that ancient Mars was much more like the Earth,

I hope you have also learned to ask questions. Because it is through clear-headed questioning that we keep learning. And the one question I hope you will continue asking, the one question I especially encourage my students to ask in class, is: “Why should I believe a word of this?”

more than just skills and information.

I hope you have also learned to ask questions. Because it is through clear-headed questioning that we keep learning. And the one question I hope you will continue asking, the one question I especially encourage my students to ask in class, is: “Why should I believe a word of this?”

When I tell students that most of the atoms in their bodies were “constructed” for them in the hot centers and final explosions of massive stars, they have every right to ask, “Why should I believe a word of this?”

with a thicker atmosphere, rivers, and lakes and could have been a site for the first stirrings of life, they have every right to ask, “Why should I believe a word of this?”

In my introductory science courses, we give the evidence, the observations, and experiments that have led us to these conclusions so that students can evaluate the steps that led us to them.

But I hope our students will continue to ask that crucial question even when the topics turn away from science.

When a candidate for high office in this

country makes derisive statements about people of one nationality or one religion, I hope you can ask them and yourself, “Why should I believe a word of this?”

When some snake-oil salesman is trying to sell you a medical cure that lies way outside the realm of serious medical knowledge, such as homeopathy or psychic surgery, I hope you will take a moment and ask them and yourself, “Why should I believe a word of this?”

When some spokesman for the coal industry is trying to convince you that global warming is not real and humanity's role in it is not established, I hope you can ask them and yourself, “Why should I believe a word of this?”

When a conspiracy-monger tells you that vaccination causes autism or that NASA faked the landings on the Moon, I hope you can ask them and yourself, “Why should I believe a word of this?”

And after you have asked that question, be sure you examine the evidence carefully and thoroughly.

Students, you have grown up in the Internet age and now have the full world of information at your fingertips day and night. Unfortunately, that also means that you have the full world of misinformation at your fingertips day and night!

What I hope your college education has helped teach you is to sift and examine that vast store of information carefully, to find out what experiments and statistically valid studies have shown and not shown, and to consider who stands to benefit from outrageous claims. In other words, to look for facts. Facts can shine their light into the dark places of our culture and illuminate them.

It's no coincidence that one of the key things the gun lobby got the Congress to do for them was to forbid the Centers for Disease Control and the National Institutes of Health to gather facts about the epidemic of gun violence that is washing over our country. Facts have a way of focusing our attention on the real world and not our fantasies, prejudices, or delusions.

So, what I most want to wish for you is that you will have a *fact-based* life—a clear-headed, questioning life—as you make your way beyond Foothill College and into our challenging world. □

(Motzer Continued from page 6)

for plant growth, consequently forming serpentine barrens (Figure 2) commonly consisting of open grassland or savannas where the climate would normally result in forest growth. Serpentine barrens also result in unique eco- or model-systems for evolution, ecology, and conservation studies of rare plant communities. Groundwater in alluvial aquifers derived from such ultra-

basic and serpentized terrain can contain Cr(VI) oxyanions, particularly chromate ( $\text{CrO}_4^{2-}$ ) and dichromate ( $\text{Cr}_2\text{O}_7^{2-}$ ), generally forming under alkaline pH and oxidizing (+Eh) conditions. In other areas, Cr(VI) oxyanions can sorb to hydrous ferrous oxide (HFO) coatings on quartz grains that may slowly release Cr(VI) oxyanions. And I'll discuss this geochemistry in my next article on this topic.



## *2016 High School Chemistry Teacher Committee*

Our High School Chemistry Teacher Committee had three events last year: (1) coordinating the Chemistry Olympiad, (2) selecting and awarding an outstanding high school chemistry teacher, and (3) providing support to high school chemistry teachers.

**Chemistry Olympiad:** Each year, our California Section co-hosts the Chemistry Olympiad with the Santa Clara Valley Section. In 2016, 260 high school students from 21 schools in our Section participated in the local exam and of those, 17 students participated in the national exam held at Las Positas College in Livermore. Two students from Irvington High School in Fremont received High Honors; they were among the top twenty students that attended the Chemistry Olympiad Study Camp and received \$50 each from our Section. Three other students received Honors and were among the top 152 students in the US. They were from California High School in San Ramon, American High School in Fremont, and Dougherty Valley High School in Dublin, and each student received \$25 from our Section.

We have been looking for ways to increase participation. In prior years, students were selected on a first-come, first-selected basis (with no more than two from any school) until our allotment was filled based on teacher

*(Meeting Report continued from page 4)*

and two-dimensional NMR analysis that led to the characterization of complex, novel structural types.

Dr. Amagata's research group at the Department of Biochemistry and Chemistry at San Francisco State University consists mostly of undergraduate students. They have been key participants in collecting samples, culturing them, extracting potential active compounds, and working on the structure elucidations. Collaborations with multiple laboratories in California have further supported the applications of these powerful screening techniques of novel bacterial strains.

Greti Sequin

recommendations. In 2015, we switched the selection process to the top students based on performance in the local exam and began awarding modest cash prizes. Last year, because ACS had announced the cancellation of the Study Camp in late 2015, we decided to have one of the Chem Clubs in our Section design an Olympiad tee-shirt to give to each student taking the local exam as an additional incentive. The tee-shirts were enthusiastically received. We will be continuing the cash prizes.

**Annual Outstanding High School Teacher Award:** Each year, our section solicits nomination of an outstanding high school teacher from our members and teachers in our Section. The teacher and the school's chemistry department each receive \$500, and the teacher is our guest at our annual awards lunch. This year, Evy Kavaler of Berkeley High School was selected.

**Support for Teachers:** Because of our large geographic area and because of the difficulty in getting teachers to attend an event teachers in their "free" time, we have joined up with a successful program at Chabot Space Center that is focused on general science programs for K-12 science teachers. On November 5, we co-hosted a workshop on Pogil method of teaching chemistry and provided numerous door prizes to help boost attendance.

Eileen Nottoli

## National Chemistry Olympiad

National Chemistry Olympiad is an annual competition among the top high school chemistry students in the United States. The top twenty students taking the National Olympiad can attend the two-week Study Camp and from that group, four students will be selected to represent the United States at the International Olympiad. For 2017, the Study Camp will be held June 6-21 and the International Olympiad will be held July 6-15 in Nakhom Pathon, Thailand.

The California and Santa Clara Valley Sections will co-host the National Olympiad exam which will be held on Saturday, April 22, 2017 at Santa Clara Univ. in Santa Clara,

Eileen Nottoli

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

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