

# THE VORTEX

AMERICAN CHEMICAL SOCIETY  
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CALIFORNIA SECTION  
FEBRUARY 2013



*Happy Valentines Day*

## *Table of Contents*

CHAIR'S MESSAGE	PAGE 3
SANTA CLARA VALLEY MOSHER AWARD	PAGE 3
FEBRUARY SECTION MEETING	PAGE 4
FAMILY SCIENCE NIGHT VOLUNTEERS	PAGE 5
POETRY AWARD	PAGE 5
GOLDILOCKS AND THE 3 ZONES PART 3 ( W. MOTZER)	PAGE 6
HOW TO LIE WITH STATISTICS	PAGE 8
RESEARCH GRANTS FOR CHEMISTS	PAGE 9
PROJECT SEED NEWS ((ELAINE YAMAGUCHI	PAGE 9
BUSINESS DIRECTORY	PAGE 11
INDEX OF ADVERTISERS	PAGE 11



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# THE VORTEX

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## Chair's Message

Wally Yokoyama

For most of us science and chemistry in particular are intrinsically interesting. Science has a practical side as well. Science and technology will drive the economies of the future, and interesting K-12 children in chemistry and science have been the focus of the California section's efforts. In an era of high unemployment, many high tech jobs go unfilled because of a lack of qualified applicants. The Bay Area is the high tech Mecca for the world but, even here with the advantages of numerous science museums and high profile tech companies, science careers are not at the top of most teenagers' lists. As a country, a recent survey reported that 49% of 9<sup>th</sup> -12<sup>th</sup> graders were "not interested" in science (USciences, Jun 15 2011). In the same survey they found that 60% of females and only 39% of males were interested in science careers. In the last high school chemistry Olympiad, the U.S. team won one gold and three silver medals. The three silver medalists and 19 of the top 20 finalists were Chinese or Indian. These statistics are reflected in the students at our own regional Chem Olympiad qualifying exams that the California and Santa Clara Valley sections support each year. We need to interest more students and politicians in

science, and we can only do that by having more participation of volunteers at local schools, libraries, science fairs, and by writing letters to our representatives.

Future science related activities can be found at [www.calacs.org](http://www.calacs.org). In this issue of the Vortex, there is a call for volunteers to work with high school teachers, students and section volunteer activities coordinated by Dr. Eileen Nottoli. We are always looking for volunteers for K-12 activities and to members of committees such as Women Chemists, Senior Chemists and Young Chemists. You can contact us through [office@calacs.org](mailto:office@calacs.org) or look on the website and contact the committee chairs directly. Also on the website are educational grants for high schools, colleges and awards for H.S. teachers including remuneration.



## 2012 Mosher Award

The Santa Clara Valley Section will present the 2012 Mosher Award to Martha and Chuck Casey at a dinner on February 28. For information and reservations, please call Lois Durham 650 322 3307.

## *The Chemistry of Red Wine: pH, SO<sub>2</sub> and Phenolics*

Al Verstuyft, Ph.D.

Al Verstuyft Consulting LLC, and Fickle Fermenters Wine Club, Napa, CA

**Date:** Thursday, Feb 21, 2013. Reception: 5:30, Dinner: 6:00, Talk: 7:00

**Place:** Solano Grill and Bar, 1133 Solano Ave, Albany, CA 94706; (510) 525-8686.

**Cost:** \$35 (Students \$18).

**RSVP:** By Thursday, Feb 14, 2013 office@calacs.org (510-351-9922). Pay at door.

**Directions:** from I-80 or I-580; Take exit for Albany / Buchanan St., head east on Buchanan St, turn left on San Pablo Ave, turn right on Solano Ave., go 1 block

**Dinner:** Organic Garden Salad Organic Mixed Greens/ Sun-dried Cranberries/ Cherry Tomatoes/Julienne of English Cucumber/ Herbed Balsamic Vinaigrette  
Select one item from each of the following 4 entrees:Marinated Breast of Chicken Garlic Mashed Potatoes/ Seasonal Vegetables/ Wild Mushroom Sauce; Atlantic Salmon Seasonal Vegetables/ Vegetable Rice/ Creamy Dill Sauce; Grilled New York Steak Seasonal Vegetables/ Garlic Mashed Potatoes/ Bordelaise Sauce; Vegetarian Dirty Rice Wild Mushroom/ Bell Peppers, Soy Bean Cake/ Jalapeno/ Ginger/ Cilantro/ Shitake Mushroom Glaze Add Chicken Add Shrimp/ Scallops, Dessert Course: Vanilla Chiffon Cake w/ Lemon Curd

### **Abstract**

Wine is “bottled poetry” said Robert Louis Stevenson. Galileo said wine is “sunshine held together by water.” Wine is appreciated for its color, taste and aroma. Chemists, some enologists and a few home winemakers are interested in the complex chemistry involving many compounds. The chemistry of the wine is constantly changing from the grapes, to the must, through the fermentation, to the bottling, and with the aging. The red wine chemistry changes from a blue red through brick red and other shades with the change in pH and the concentration of flavonoids (tannins) and anthocyanins (color). Color is used to judge the quality and age of the wine.

“Fine wines are made in the vineyard” is not just marketing hype. The pH, sugar (brix), volatile acids, and total acids are key properties of the grapes. Since the mid 1970’s wineries and home winemakers know pH is likely the most important test. The relationship of pH and SO<sub>2</sub> was explained in the early 1980s and the term molecular SO<sub>2</sub> came into common usage. This has led to lower sulfite and no sulfite winemaking. Understanding the pH and phenolics has improved winemaking through color stability, reduced astringency and increased softening

and minimizing of unwanted compounds. “Wine is proof that God loves us and desires us to be happy.” said Ben Franklin!

### **Biography**

Al Verstuyft formed Al Verstuyft Consulting, LLC in 2011 after a 32 year career with Chevron. He was Global Laboratory Coordinator/Senior Consulting Scientist for Chevron’s Energy Technology Co. He provided petroleum and environmental analysis and chemistry consulting to Chevron and its licensees laboratories worldwide. As Global Lab Coordinator, he provided Chevron operating companies and licensees access to Chevron’s Technology Company laboratories experienced in solving complex sampling, analysis and quality problems for petroleum and environmental laboratories and operations. He started his professional career at the National Institute for Occupational Safety and Health (NIOSH) as Research Analytical Chemist.

Al was or is currently a member of the American Petroleum Industry’s Test Methods Task Force, and Environmental Monitoring Task Force; the Western State Petroleum Association Test Methods Task Force for Petroleum Fuels; the American Society

*(continued on page 10)*

## Call for Family Science Night Volunteers

Calling all volunteers who would like to join the fun as the California Section takes Family Science Night to Bancroft Middle School in San Leandro on Tuesday, March 12th, 2013, 6 PM to 8 PM.

No experience necessary -- we have a full lineup of fun activities, with experienced volunteers who enjoy explaining how things work! You will be one of us in no time, and you, too, will see kids light up as they discover the wonder of science.

The Science Jam will open the show -- middle school science teachers in Livermore by day, these veteran rockers have a memorable repertoire of hard science songs. Past Section Chair Bryan Balazs will take the stage with a series of exciting chemistry demonstrations, and then it will be time for the hands-on activities that will fill the science classrooms. At the end of the evening, we will have souvenirs for all participants -- and liquid nitrogen ice cream. We expect a big turnout for this event -- Bancroft Middle School has a diverse student population of over 1000, and the word will go out to their families and to the local elementary schools. The Bancroft staff and the PTA are ready to welcome us.

Since 1997, the California Section has taken Family Science Night to at least one middle school per year, and often two, with spring events in addition to the fall NCW program. These are the Section's most visible outreach events, and they offer unique opportunities for students and their families to see real scientists in action. Hope you will join us!

For more information, please contact: Alex Madonik 510-872-0528 mobile <m a d o n i k a @ c o m c a s t . n e t > Margareta Séquin <msequin@sfsu.edu> NCW Coordinators California Section, ACS

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## National Chemistry Week Poetry Winner



The Livermore Patch Reported that Livermore third grader, Sarah Rudd from the Emma C Smith Elementary School was the winner of the California Section Poetry Contest. This is an annual contest supported by the American Chemical Society as part of The National Chemistry Week celebrations.

Here is Sarah Rudd's five line submission on buckyballs.

### *Buckyballs*

Buckyballs are small.

Buckyballs are so small you can't see them at all.

Quantum dots are just the same.

They can't be seen—it's insane.

Nanotech is technology smaller than the eye can see!

The California Section of the American Chemical Society, sponsor of the poetry contest, selected Sarah as winner for her word choice and imagery, adherence to poem style, originality and creativity, and overall presentation. Her entry now has been submitted to the National ACS.



### *Workshops and Classes*

Dr. Margareta Séquin will present on Saturday, February 2, 10:30 am, "Hiking with a Chemist - admiring plants through a chemist's eyes" at the Visitor Center of the Regional Parks Botanic Garden in Tilden Park, as part of the Wayne Roderick Lectures.

On Feb. 19 Dr. Swquin will give a Science Cafe "Plants, Perfumes, and Poisons" at the Lafayette Library and Learning Center.



## *Goldilocks and the Three Zones* (Part 3)

Bill Motzer

In Part 1 (September 2012 *Vortex*), the Goldilocks Zone, also known as the habitable

zone (HZ-1), was defined as the distance from a star that a terrestrial-like planet could maintain liquid water on its surface and consequently contain terrestrial-like life. The next HZ is believed to be one occurring within a galaxy and therefore is called the galactic habitable zone (GHZ) or HZ-2.

The classic GHZ (HZ-2) has been hypothetically defined as a galactic region with conditions best suited to development and survival of terrestrial-type life. For a barred spiral galaxy, the Milky Way's diameter ranges from approximately 100,000 to 120,000 light years (LY), about 1,000 LY in thickness, and contains 200 to 400 billion stars. Its GHZ is believed to extend from 23,000 to 29,000 LY from the galactic center. (The Sun is about 26,000 to 28,000 LY from the galactic center.) Additionally, it appears that the Milky Way's GHZ is slowly expanding or widening with time with its width controlled by two factors. The inner limit, closer to the galaxy's center, has a high stellar density (about 100 stars per  $3.26 \text{ LY}^3$  when compared to a stellar density of 1.0 star per  $3.26 \text{ LY}^3$  in our Sun's vicinity). Such high stellar densities could potentially threaten formation of complex carbon-based life with nearby ionizing radiation sources including those from supernovas and gamma ray bursts (GRB). Most stars in this region are O-type blue giants, 10 to 50 times more massive than the Sun. These young (a few million years old) stars emit UV radiation generally strong enough to fry most – if not all – life. A safe distance from an O-type star is at least 10 LY. An outer limit, generally occurring in the spiral arms imposed by galactic chemical evolution, is detected by the abundance of heavier elements produced by super novae, resulting in metal-rich stars and planets, which are required to harbor life. Therefore, a planetary system should be close enough to the metal-rich galactic

center where a sufficient quantity of heavy elements (e.g. carbon, oxygen, silicon, iron, etc.) exist favoring rocky or terrestrial-type planet formation. Heavier elements are also required to form the complex molecules of life (e.g., DNA) and energy sources (e.g., chlorophyll) needed to keep life going.

Very recent astronomical observations have supported the classical GHZ hypothesis but the Milky Way's GHZ may actually be governed more by the presence of a central black hole (BH) than by stellar density alone. Observations of stars orbiting closest to the galactic center and an intense radio source in this region indicate a massive, compact object, currently explained as a super massive BH designated as Sagittarius A\* or Sag A\*. Stars and interstellar gas orbiting Sag A\* suggest it has a radius of about 3.0 billion km and mass of 4.1 to 4.5 million Suns. This agrees with other observations indicating that super massive BHs are located near most galactic centers. Such active galactic nuclei (AGN) have been designated as Seyfert Galaxies which are characterized by extremely bright nuclei and spectra with very bright hydrogen, helium, nitrogen, and oxygen emission lines.

AGNs may also switch “on” and “off” over time (known as a duty cycle, where active accretion occurs or ceases) and it's believed that the Milky Way's BH is presently inactive and actually much smaller than other galaxies (e.g., the Andromeda Galaxy may have an AGN that is 100 times larger). But, when active, the Milky Way's BH has grown over time by accreting gas and disrupted stars. While active, the BH's accretion disk is believed to emit intense electromagnetic and particle radiation radiating perpendicular to the galactic plane. Recently, astronomers reported “bubbles” of emitting energy resulting from star formation at the galactic center. Discovered in 2010 by NASA's Fermi Gamma-ray Space Telescope, these Fermi bubbles are each 25,000 LY in length and are indeed perpendicular to the galactic plane indicating that the BH has been active only about 40% of the time in the recent past, perhaps within the past 500 million years.

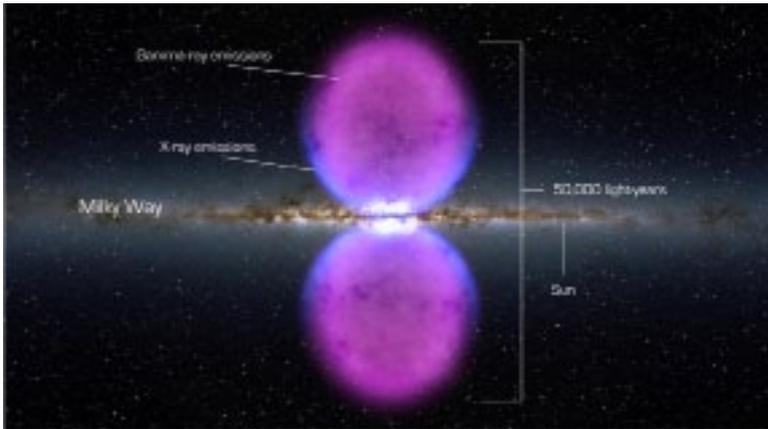
*(Continued on page 7)*

*(continued from page 6)*

Energy calculated from the luminosity of other AGNs suggest that when the duty cycle is switched on, the Milky Way's AGN energy output would be about  $10^{44}$  ergs per second or 2 to 10 keV in the X-ray band, which is about a typical supernova's energy output in less than a year. Planets located in the GHZ would be most protected from ionizing photons produced by an AGN. For example, such X-ray impact to Earth would be about 130 ergs per  $m^2$  per second, without any intervening absorption (i.e., interstellar dust and gas). This energy output is about 20 times that of the Sun in the same energy band, which is comparable to a typical X-ray solar flare. If intervening absorption is taken into account, the X-ray impact would be comparable to that of the Sun's average X-ray value. Thus, X-ray emissions from an AGN outburst would probably not significantly impact life

on Earth, but it would for planets within 3,200 to ~6,000 LY of the Galactic center. The fact the Milky Way has a smaller and less active BH than many other galaxies may make it atypical to other galaxies and perhaps this is also conducive to the formation of life.

On January 7, 2013, NASA reported that the Kepler Space Telescope had detected 461 new possible exoplanets resulting in a total of 2,740 exoplanets detected by Kepler in 22 months of operation. Although only 105 have been confirmed, four of the new planets are 1.25 to 2.0 times as large as Earth and are believed to occur within their star's HZ. Additionally, a recent stellar statistical study indicated that there might be as many as 17 billion planets in the Milky Way. If this is true and only 10% reside in the GHZ, then the possibility of life on a terrestrial-type planet becomes increasingly feasible.



*Milky Way Fermi (gamma ray) bubble simulation from NASA ([http://www.nasa.gov/mission\\_pages/GLAST/news/new-structure.html](http://www.nasa.gov/mission_pages/GLAST/news/new-structure.html))*

*Happy Valentine's Day*

## *How to lie with statistics I*

A scientific study published in *The Lancet* (<http://www.thelancet.com/journals/laninf/article/PIIS1473-3099%2811%2970295-X/abstract>) reveals that influenza vaccines only prevent influenza in 1.5 out of every 100 adults who are injected with the flu vaccine. Yet, predictably, this report is touted by CDC and the scientific mainstream media as proof that “flu vaccines are 60% effective!” This absurd claim is repeated across the media over and over.

According to *NaturalNews*, the “60% effectiveness” claim is a lie. Most people will assume that “60% effectiveness” means that for every 100 people injected with the flu shot, 60 of them won’t get the flu! The claim implies that getting a flu shot has about a 6 in 10 chance of preventing you from getting the flu. This is false.

In reality, as is shown in Figure 2 of the study itself, which is entitled, “Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis” -- only about 2.7 in 100 adults get the flu in the first place! Flu vaccine stops influenza in only 1.5 out of 100 adults who get the shots. From the study, the “control group” of adults consisted of 13,095 non-vaccinated adults who were monitored to see if they caught influenza. Over 97% of them did not. Only 357 of them caught influenza, which means only 2.7% of these adults caught the flu in the first place. The “treatment group” consisted of adults who were vaccinated with a trivalent inactivated influenza vaccine. Out of this group, according to the study, only 1.2% did not catch the flu. The difference between these two groups is 1.5 people out of 100. So the “scientific” conclusion from this is rather astonishing: Flu vaccines only prevent the flu in 1.5 out of every 100 adults injected with the vaccine!

So where does “60% effective?” come from? This is an old statistical trick of massaging the numbers. First, take the 2.73% in the control group who got the flu, and you divide that into the 1.18% in the treatment group who got the flu. This gives you 0.43. You can then say that 0.43 is

“43% of 2.73,” and claim that the vaccine therefore results in a “57% decrease” in influenza infections. This then becomes a “57% effectiveness rate” claim. The overall “60% effectiveness” being claimed from the mentioned study comes from adding additional data about vaccine efficacy for children, which returned higher numbers in 12 out of 100 children.

Put another way, when you see 100 adults lined up at a pharmacy waiting to receive their flu shots, nearly 99 out of those 100 are not only wasting their time (and money), but may actually be subjecting themselves to long-term neurological damage as a result of being injected with flu shot chemical adjuvants.

There are other problems with this *Lancet* study:

#1) The “control” group was often given a vaccine, too. In many of the studies used in this meta analysis, the “control” groups were given so-called “insert” vaccines which may have contained chemical adjuvants and other additives but not attenuated viruses. Why does this matter? Because the adjuvants can cause immune system disorders, thereby making the control group more susceptible to influenza infections and distorting the data in favor of vaccines. The “control” group, in other words, wasn’t really a proper control group in many studies.

#2) Flu vaccines are NEVER tested against non-vaccinated healthy children. It’s the most horrifying thought of all for the vaccine industry: Testing healthy, non-vaccinated children against vaccinated children. It’s no surprise, therefore, that flu shots were simply not tested against “never vaccinated” children who have avoided flu shots for their entire lives. That would be a real test, huh? But of course you will never see that test conducted because it would make flu shots look laughably useless by comparison.

#3) There is no observation of long-term health effects of vaccines. Vaccines are considered “effective” if they merely prevent the flu. But what if they also cause a 50% increase in Alzheimer’s two decades later? Is that still a “success?” If you’re

*continued on page 10*

## *Research Grants for Chemists*

The U.S. Environmental Protection Agency (EPA), in collaboration with the National Science Foundation (NSF), announced two funding opportunities for up to ten grants totaling up to \$32 million for research on the design of safer chemicals. These two Requests for Applications (RFAs), which focus on sustainable chemical design and assessment of the life cycle impacts of chemicals from production to disposal, will support research to create chemicals that are safer for people and the environment.

The research resulting from these two solicitations, "Networks for Sustainable Molecular Design and Synthesis" and "Networks for Characterizing Chemical Life Cycle" will enhance cooperation among the chemical sciences, materials research, geosciences, engineering, and biomedical and public health communities.

The sustainable chemical design solicitation requests applications from trans-disciplinary research teams who want to replace toxic and expensive chemicals with greener, safer alternatives.

EPA/NSF Networks for Sustainable Molecular Design and Synthesis - Open: December 19, 2012 - Closing: March 18, 2013

The chemical life cycle solicitation seeks research to further the understanding of chemicals (including nanomaterials, materials produced at the nano-scale) throughout the life cycle at the systems and molecular levels. This research has the potential to provide tools to characterize and predict health and environmental effects.

EPA/NSF Networks for Characterizing Chemical Life Cycle - Open: December 19, 2012 - Closing: March 18, 2013

## *Project SEED News*

This year we saw an increase (45 vs. 40) in the program size relative to 2011. Our aggressive fundraising contributed to this increase in students. The program consisted of 34 Project SEED I students and 11 Project SEED II students, where the Project SEED II students were funded in part by the Bechtel donation of \$15,000, an increase from 2011. SEED I students could earn \$2,500 while SEED II students could earn \$3,000 in 2012, equal to 2011. SEED I contributors included Chevron, Bio-Rad, California Section and its members, and the National ACS.

Mr. Kenneth Nelson of Chevron has volunteered to be the Chevron coordinator (onsite) for the SEED program in 2013. I will be volunteering from home. Dr. Andrew Breksa will be the Western Regional Research Center (WRRC) coordinator next year.

In September 2012, we lost our friend and co-coordinator, Dr. Glenn Fuller. He will be missed by the CA Section SEED committee as a whole and by me in particular. Glenn remained an active SEED coordinator through the 2012 program. In his honor, the

CA Section has established a special award for the best SEED II student. A cash award will be given for the first time after the 2013 program, based on the presentation, student report, and mentor comments.

In October 2012, I was honored with the USDA Ladell Crawford Award. Ladell Crawford was a WRRC scientist from 1971-1998 who promoted cooperation, communication and education at the Western Regional Research Center. Throughout his career he was active in Labor Management issues, was a founding instructor for the Academic Workshop, and, in general, promoted the well-being of WRRC employees.

In recognition of this, the WRRC Labor-Management Forum announced expansion of the Ladell Crawford Award to recognize outstanding contributions toward improved labor-management relations at the Center, and/or improved community outreach programs. WRRC is to present an annual award to those who, like Ladell Crawford, promote cooperation, communication, and education at WRRC. I was the first non-USDA person to receive this award. Glenn Fuller would be smiling about this.

E. S. Yamaguchi

THE VORTEX

*(continued from page 8)*

a drug manufacturer it is, because you can make money on the vaccine and then later on the Alzheimer's pills, too. That's probably why neither the CDC nor the FDA ever conducts long-term testing of influenza vaccines. They simply have no willingness whatsoever to observe and record the actual long-term results of vaccines.

#4) 99.5% of eligible studies were excluded from this meta-analysis. There were 5,707 potentially eligible studies identified for this meta-analysis study. A 99.5% of those studies were excluded for one reason or another, leaving only 28 studies that were "selected" for inclusion. Give that this study was published in a pro-vaccine medical journal, and authored by researchers who likely have financial ties to the vaccine industry, it is very difficult to imagine that this selection of 28 studies was not in some way slanted to favor vaccine efficacy.

This statistical lying technique is very popular in the cancer industry, too, where these "relative numbers" are used to lie about all sorts of drugs. You may have heard, for example, that a breast cancer drug is "50% effective at preventing breast cancer!" But what does that really mean? It could mean that 2 women out of 100 got breast cancer in the control group, and only 1 woman out of 100 got it in the treatment group. Thus, the drug is only shown to work in 1 out of 100 women.

But since 1 is 50% of 2, they will spin the store and claim a "50% breast cancer prevention rate!" And most consumers will think to themselves, "Wow, if I take this medication, there is a 50% chance this will prevent breast cancer for me!" And yet that's utterly false. In fact, there is only a 1% chance it will prevent breast cancer for you, according to the study.

In the fictional example given above for a breast cancer drug, let us suppose the drug prevented breast cancer in 1 out of 100 women, but while doing that, it caused kidney failure in 4 out of 100 women who take it. The manufacturer of the drug would

spin all this and say something like the following: "This amazing new drug has a 50% efficacy rate! But it only causes side effects in 4%!"

Fraud is not the exception in today's modern world. It is not limited to the Pharma industry, it is present whenever there is lots of money to be made.

Who is there to speak up against the actions of those individuals and corporations who in the absence of effective regulatory agencies, callously and intentionally misinform? Those of us who have been trained in the scientific method, may be best prepared to take on this task.

Lou Rigali



*(continued from page 4)*

for Testing and Materials committees on Petroleum D-2, Water D-19; and Waste D-34. He was appointed to boards and committees including EPA Environmental Laboratory Advisory Board, EPA/NELAC On-Site Assessment committee, CAL-DOHS Environmental Laboratory Technical Advisory Board CAL-EPA Laboratory Waste Regulatory Taskforce California Water Resources Board, Laboratory Accreditation Panel. Al was a U.S. DOE Visiting Scientist at Sandia National Laboratories, Burner Engineering Research Lab. He was recently appointed to the American Chemical Society's Committee on Analytical Reagents.

Dr. Verstuyft received a B.S. Chemistry from Santa Clara University, a Ph.D. in Inorganic/Organometallic Chemistry from University of Nevada at Reno, and was a Postdoctoral Associate in Physical Organic Chemistry at University of Utah. He is the author of 18 peer reviewed papers and 25 presentations.



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