

# THE VORTEX

AMERICAN CHEMICAL SOCIETY  
VOLUME LXXV NUMBER 10

CALIFORNIA SECTION  
NOVEMBER 2014

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Attend the November meeting and listen to Dr. Sandra Sachs of the Oakland Police Department Crime Lab

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## *Chair's Message*

Mark Frishberg

By the time our members read this message, CAL-ACS will have completed another successful National Chemistry Week. This year was an "NCW plus" because in addition to our normal Family Science Night at a middle school we also had a similar event for the Girl Scouts in Fairfield the Sunday of NCW and, skipping a week, CAL-ACS participated again in the Bay Area Science Festival at AT&T Park in San Francisco. Thanks again to Alex Madonik, Greti Sequin, Janet Schunk, the team from Chevron, our student volunteers, and all of our other volunteers that make these public outreach events possible. When you add in the special "Chemistry in the Theater" event with Dr. Carl Djerassi that Charlie Gluchowski arranged at the Z Theater in San Francisco on the Tuesday of NCW, it was a very busy and productive few weeks for CAL-ACS.

I had planned to take part in all of these events, but unfortunately a virus that I picked up during a trip to France for a conference the first two weeks of October put me out of commission during the NCW events, and I was only able to attend the Bay Area Science Festival on Nov. 1st and the career counseling seminar that I presented at Sonoma State University a day earlier.

Besides being sick, I felt doubly bad in missing these events as I feel that our public outreach events are the most important events that our local section offers our community, and I know first-hand what they can mean in influencing the eventual careers of even the youngest of our visitors. Are you able to look back and identify the moment or event that most influenced your decision to become a chemist or a chemical engineer? I can. It was the day that my Cub

Scout troop visited the Franklin Institute in Philadelphia when I was six years old. In addition to the other hands-on science related exhibits for which that museum is famous, on the day of our visit there was also a chemistry demonstration show. I found myself mesmerized by the show. When I got home that day I began mixing things together in the kitchen to see what would happen, just like the chemical demonstrator appeared to do earlier in the day. Naturally, I made a mess and even caught a pot on fire, much to the dismay of my parents who had never seen me act that way. Even though neither of my parents had gone to college nor knew anything about chemistry, within a week I had a starter Gilbert chemistry set and was performing my own chemical demonstrations for my neighborhood friends on the stoop in front of our row house. I doubt that my parents realized that they were jump-starting my career at the time, and were likely just trying to protect the house. Either way, I have been a chemist and have been performing chemistry demonstrations long before there was a NCW, in junior high during science class, in high school chem. club, during the time I was a grad student TA and adjunct professor, and in major community events back east prior to moving to the CAL-ACS local section twelve years ago.

Knowing that National Chemistry Day, which became National Chemistry Week, originated with CAL-ACS makes these activities even more special and something that our members can point to with pride. As we get more exposure in the community with these events, we are getting more invitations to put on similar events, a great result, but one that is taxing our volunteer team and public outreach budget. We have begun to discuss how to identify new volunteers and funding opportunities, and invite any interested members to join in this worthwhile effort.



# THE VORTEX

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## California Section November Meeting

**Speaker:** Dr. Sandra Sachs, Oakland Police Department Crime Lab

**Title:** Adventures of a Forensic Scientist

**Date:** November 18, 2014

**Time/Schedule:** 5:30 – 6:30 PM Social Hour, 6:45-8:00PM Section Meeting,

**Location Chabot College:** 25555 Hesperian Blvd, Hayward, CA, Community Event Center Room 722D, Park in Student Lot G

**Cost \$10:** Food and Soft Drinks during Social Hour; Chabot College parking fee - \$2 (pay at machines on campus)

**Reservations:** Please contact Julie Mason at [office@calacs.org](mailto:office@calacs.org), 510-351-9922.

### Abstract:

Have you wondered about the science used in a crime laboratory? With a nod to the American Chemical Society sponsorship, this talk will focus mostly on chemistry techniques used both in the laboratory and in the field. Drug analysis, forensic toxicology, gunshot residue analysis will be covered. Life as a forensic professional will be touched upon.

### Biography:

Sandra Sachs is a working forensic scientist, currently as the Supervisor of the Drug Analysis Unit at the Oakland Police Department Criminalistics Laboratory. She has also practiced forensic science at the San Francisco Police Department Crime Lab as a Criminalist and with the San Francisco Medical Examiner's office as a Forensic Toxicologist. She received a B.S. in Chemistry from the University of Nebraska, Lincoln, through

the University honors program and graduated Phi Beta Kappa and with High Distinction. She continued her education at Stanford University where she obtained a Ph.D. studying electron transfer through monolayer films under the direction of Professor Christopher Chidsey. Sandra is a full member of the American Academy of Forensic Sciences, the California Association of Criminalists, California Association of Crime Laboratory Directors, American Society of Crime Laboratory Directors and a member of the California Association of Toxicologists, the International Association of Forensic Toxicologists, the Society of Forensic Toxicologists and the American Chemical Society.

She recently became a core committee member of SWG-DRUG - the scientific working group in seized drug analysis and serves as an assessor of crime laboratories. She has spoken at national and international

(continued on page 7)

## *Key Facts From The World Health Organization (WHO)*

Ebola virus disease (EVD), formerly known as Ebola haemorrhagic fever, is a severe, often fatal illness in humans. The virus is transmitted to people from wild animals and spreads in the human population through human-to-human transmission.

The average EVD case fatality rate is around 50%. Case fatality rates have varied from 25% to 90% in past outbreaks.

Early supportive care with rehydration, symptomatic treatment improves survival. There is no licensed treatment proven to neutralise the virus but a range of blood, immunological and drug therapies are under development.

Ebola virus disease (EVD) first appeared in 1976 in 2 simultaneous outbreaks, one in Nzara, Sudan, and the other in Yambuku, Democratic Republic of Congo. The latter occurred in a village near the Ebola River, from which the disease takes its name.

The current outbreak in West Africa, (first cases notified in March 2014), is the largest and most complex Ebola outbreak since the Ebola virus was first discovered in 1976. There have been more cases and deaths in this outbreak than all others combined. It has also spread between countries starting in Guinea then spreading across land borders to Sierra Leone and Liberia, by air (1 traveller only) to Nigeria, and by land (1 traveller) to Senegal.

The most severely affected countries, Guinea, Sierra Leone and Liberia have very weak health systems, lacking human and infrastructural resources, having only recently emerged from long periods of conflict and instability. On August 8, 2014, the WHO Director-General declared this outbreak a Public Health Emergency of International Concern.

A separate, unrelated Ebola outbreak began in Boende, Equateur, an isolated part of the Democratic Republic of Congo.

The virus family Filoviridae includes 3 genera: Cuevavirus, Marburgvirus, and Ebolavirus. There are 5 species that have been identified: Zaire, Bundibugyo, Sudan, Reston and Tai Forest. The first 3, Bundibugyo ebolavirus, Zaire ebolavirus, and Sudan ebolavirus have been associated

with large outbreaks in Africa. The virus causing the 2014 west African outbreak belongs to the Zaire species.

### **Transmission**

It is thought that fruit bats of the Pteropodidae family are natural Ebola virus hosts. Ebola is introduced into the human population through close contact with the blood, secretions, organs or other bodily fluids of infected animals such as chimpanzees, gorillas, fruit bats, monkeys, forest antelope and porcupines found ill or dead in the rainforest.

Ebola then spreads through human-to-human transmission via direct contact (through broken skin or mucous membranes) with the blood, secretions, organs or other bodily fluids of infected people, and with surfaces and materials (e.g. bedding, clothing) contaminated with these fluids.

Burial ceremonies in which mourners have direct contact with the body of the deceased person can also play a role in the transmission of Ebola.

People remain infectious as long as their blood and body fluids, including semen and breast milk, contain the virus. Men who have recovered from the disease can still transmit the virus through their semen for up to 7 weeks after recovery from illness.

### **Symptoms of Ebola virus disease**

The incubation period, that is, the time interval from infection with the virus to onset of symptoms is 2 to 21 days. Humans are not infectious until they develop symptoms. First symptoms are the sudden onset of fever, fatigue, muscle pain, headache and sore throat. This is followed by vomiting, diarrhoea, rash, symptoms of impaired kidney and liver function, and in some cases, both internal and external bleeding (e.g. oozing from the gums, blood in the stools). Laboratory findings include low white blood cell and platelet counts and elevated liver enzymes.

### **Diagnosis**

It can be difficult to distinguish EVD from other infectious diseases such as malaria, typhoid fever and meningitis. Confirmation that symptoms are caused by Ebola virus

*(continued on page 5)*

*(Ebola continued from page 4)*

infection are made using the following investigations:

- antibody-capture enzyme-linked immunosorbent assay (ELISA)
- antigen-capture detection tests
- serum neutralization test
- reverse transcriptase polymerase chain reaction (RT-PCR) assay
- electron microscopy
- virus isolation by cell culture.

Samples from patients are an extreme biohazard risk: laboratory testing on non-inactivated samples should be conducted under maximum biological containment conditions.

### **Treatment and vaccines**

Supportive care-rehydration with oral or intravenous fluids- and treatment of specific symptoms, improves survival. There is as yet no proven treatment available for EVD. However, a range of potential treatments including blood products, immune therapies and drug therapies are currently being evaluated. No licensed vaccines are available yet, but 2 potential vaccines are undergoing human safety testing.

### **Prevention and control**

Good outbreak control relies on applying a package of interventions, namely case management, surveillance and contact tracing, a good laboratory service, safe burials and social mobilisation. Raising awareness of risk factors for Ebola infection and protective measures that individuals can take is an effective way to reduce human transmission. Risk reduction messaging should focus on several factors:

Gloves and appropriate personal protective equipment should be worn when taking care of ill patients at home. Regular hand washing is required after visiting patients in hospital, as well as after taking care of patients at home.

Outbreak containment measures including prompt and safe burial of the dead, identifying people who may have been in contact with someone infected with Ebola, monitoring the health of contacts for 21 days, the importance of separating the healthy from the sick to prevent further spread, the importance of good hygiene and maintaining a clean environment.

### **Controlling infection in health-care settings:**

Health-care workers should always take standard precautions when caring for patients, regardless of their presumed diagnosis. These include basic hand hygiene, respiratory hygiene, use of personal protective equipment (to block splashes or other contact with infected materials), safe injection practices and safe burial practices.

Health-care workers caring for patients with suspected or confirmed Ebola virus should apply extra infection control measures to prevent contact with the patient's blood and body fluids and contaminated surfaces or materials such as clothing and bedding. When in close contact (within 1 metre) of patients with EBV, health-care workers should wear face protection (a face shield or a medical mask and goggles), a clean, non-sterile long-sleeved gown, and gloves (sterile gloves for some procedures).

Laboratory workers are also at risk. Samples taken from humans and animals for investigation of Ebola infection should be handled by trained staff and processed in suitably equipped laboratories.

### **WHO response**

WHO aims to prevent Ebola outbreaks by maintaining surveillance for Ebola virus disease and supporting at-risk countries to develop preparedness plans. The document provides overall guidance for control of Ebola and Marburg virus outbreaks:

When an outbreak is detected, WHO responds by supporting surveillance, community engagement, case management, laboratory services, contact tracing, infection control, logistical support and training and assistance with safe burial practices.

### **WHO has developed detailed advice on Ebola infection prevention and control:**

Infection prevention and control guidance for care of patients with suspected or confirmed Filovirus haemorrhagic fever in health-care settings, with focus on Ebola

WHO Media centre

Telephone: +41 22 791 2222

E-mail: [mediainquiries@who.int](mailto:mediainquiries@who.int)







## *Saluting Stable Isotopes Part 3 Osteochemistry*

Bill Motzer

*"A horse, a horse, my  
kingdom for a horse!"*

*The Tragedy  
of King Richard III:*

*a play by  
William Shakespeare  
~1592*

During this and past Halloweens, I've been visited by tiny ghosts, goblins, and skeletons – which reminded me of a very famous skeleton recently in the news. Richard III (1452 – 1485) became King of England in 1483 until his untimely death in August 1485 at the Battle of Bosworth Field, the last decisive battle of the Wars of the Roses. At the age of 32, Richard was killed in this conflict, making him the last English king to die in battle. He was buried, apparently without ceremony, and his tomb was believed to have been destroyed during the 16<sup>th</sup> century Protestant Reformation, remaining lost for over 500 years when, in 2012 an archeological excavation using ground penetrating radar discovered his grave and skeleton.

In February 2013, University of Leicester archeologists & anthropologists confirmed the skeleton's age by radiocarbon dating (ca 1455-1540); a mitochondrial DNA comparison with two descendants of Richard III's eldest sister, Anne of York, confirmed the lineage. A standard forensic examination revealed at least eleven skeletal wounds, of which four were apparent minor injuries to the skull, one knife blow to the cheekbone, a cut on the lower jaw, two fatal injuries to skull's base, one cut to a rib, and a final wound on the pelvis, perhaps inflicted after death. One skeletal injury may also have been postmortem. None of the wounds were healed or overlapping and the examination showed that they were consistent with weapons used during the late medieval period. The skull wounds suggested that Richard had lost his helmet, coinciding with accounts by others at that time and he may have been killed by a

final blow to the head. Additionally, the skeleton's physical appearance showed a spinal curvature, which is highly consistent with contemporary accounts of Richard's appearance in that he is believed to have suffered from scoliosis causing him to walk with a stoop. Dental tests also indicates some missing molars and standard anthropological dry bone age estimation techniques suggested that this was at least a 20 to 30 year-old adult. Additional standard post-mortem computed tomography (CT) methods produced a narrower age range estimation of 30 to 34 years.

Although these analyses are interesting, a follow up chemical and isotopic examination of the skeleton by a team from the NERC Isotope Geosciences Laboratory, British Geological Survey, University of Leicester Archaeological Services, and the University of Leicester School of Archaeology and Ancient History are even more intriguing. By examining King Richard's teeth and bone they were able to learn more about his lifestyle, including his early childhood origins, environmental conditions during his life, and his dietary history, particularly focusing on the changes that occurred when he was crowned King.

Richard's childhood origin and lifestyle could be determined by oxygen and strontium isotopes in teeth and bone biogenic phosphate in bone at the time of formation; once fixed, these isotopes will not change during the person's life, nor will they alter after burial. Oxygen isotope ratios ( $\delta^{18}\text{O}$ ) can be used to determine the source of ingested water (see the December 2012 *Vortex*: Saluting Stable Isotopes, Part 1), that is incorporated into the body's anatomy. In particular, the  $\delta^{18}\text{O}$  ratios in phosphate composing the skeletal bones and tooth enamel can provide information on sources of drinking water because they are largely composed of hydroxyapatite [ $\text{Ca}_5(\text{PO}_4)_3(\text{F},\text{Cl},\text{OH})$ ], a relatively rare form of the mineral apatite.

Phosphate oxygen isotope ratios ( $\delta^{18}\text{O}_p = 16.7\text{‰}$ ) show that Richard's early childhood (~3 years of age) was spent in the eastern part of England, which is consistent with his known birth place in Northamptonshire. Low rainfall in this region has similar  $\delta^{18}\text{O}$

*(continued on page 7)*

*(Motzer continued from page 6)*

ratios ( $17.2\% \pm 1.3\%$ ). His later childhood (~age 7) tooth enamel had a  $\delta^{18}\text{O}_\text{p}$  value of  $\sim 18\%$ , which is typical of populations in western England's higher rainfall areas ( $\delta^{18}\text{O}_\text{p} = 18.2\% \pm 1\%$ ).

Strontium isotopes ( $^{87}\text{Sr}/^{86}\text{Sr}$ ) are largely derived from diet and generally relate to an area's geology and soils where consumed food was produced. The University of Leicester researchers analyzed and examined Sr isotope data from the same teeth ( $^{87}\text{Sr}/^{86}\text{Sr} = 0.711$ ). The Northamptonshire area has predicted  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios mostly in the range of 0.709-0.710. More elevated  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios are common to Paleozoic rocks (+250 million years old) occurring on Britain's southwestern side. The combined O and Sr isotope data suggest that by the age of seven

or eight, Richard III was living in western Britain. Historical documents tend to support this: Richard was born and spent his very early childhood in Northamptonshire; he then resided at Ludlow Castle in the Welsh marches in 1459, which are more westerly than Northampton. Finally, the oxygen isotope compositions recorded in both his dentine and femoral bone begin decreasing in perumil values through adolescence and into adulthood, consistent with most of his life being spent in eastern England.

More intriguing are the additional isotopes that were used to determine Richard's environment during his short life (e.g., lead isotopes) and his lifestyle including diet (i.e., using carbon and nitrogen isotopes). And we will investigate these in Part 4.



King Richard III's skeleton unearthed beneath a Leicester, England, car park. From BBC News Leicester at: <http://www.bbc.com/news/uk-england-leicestershire-21063882>

*Meeting continued from page 3*

conferences and provided training to local, state and federal agencies in academia and government on her research involving the interpretation of mass spectra of

various controlled substances, most extensively on the class of compounds known as phenethylamines which includes methamphetamine.

## HAPPY THANKSGIVING

We are approaching the Holiday Season which for many is a time to remember being thankful for our blessings; families and friends. Traditionally it is also a time of giving because sharing feels good and for some it lowers a tax burden.

This note is to alert you that The California Section qualifies as a tax exempt non-profit corporation and one with extremely low administrative costs. Mark Frishberg, the Chair, has in many of his monthly Chair messages in the *Vortex* described the various events that are supported by the Section but ultimately supported by you, its Members, through dues and occasional gifts. The Section is grateful and appreciative to those individuals and companies who have gifted.

The members in the various committees and volunteers receive no payment for their services but do receive a lot of benefit from seeing, first hand, how their participation helps students, teachers and families.

As always we have a need for additional volunteers and similarly for additional funds. Visit the [www.calacs.org](http://www.calacs.org), click on each of the three tabs, Programs, Events, Grants and Awards to review our award-winning outreach activities. Pick one or more, volunteer your time and/or gift. You can designate it for a specific program or leave it to the discretion of the Section.

In the coming months we will continue this topic, meanwhile we solicit your comments and suggestions.

Happy Thanksgiving from the Members of the Executive Committee, the Board of Directors, and the *Vortex* staff

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**Prof. Dean Toste**  
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*Catalytic Enantioselective  
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**Prof. Ryan Altman**  
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*Deoxygenative and Decarboxylative  
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**Prof. Qilong Shen**  
Shanghai Institute of  
Organic Chemistry  
*Electrophilic Reagents for  
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**Prof. Jimmie Weaver**  
Oklahoma State University  
*Perfluoroarenes: From Inert  
Solvents to Synthetic Linchpins*



## October Section Meeting Report

Tuesday October 21 --- Together with the Santa Clara Section, the California Section held a joint meeting at Z Space, a performance arts venue that includes theater, dance and music, for a performance of Carl Djerassi's play, *Insufficiency*. The building housing Z Space is in the Mission District of San Francisco.

The evening started with an excellent and casual buffet of hors d'oeuvres, sandwiches and salads along with the playwright engaged in conversations and book signing of an unofficial prerelease of his new autobiography, "In Retrospect, From The Pill to The Pen".

The play, a poignant comedy, depicts the academic experience of the untenured Professor Jerzy Krzyz pursuing the science of bubbleology in the chemistry department of a small unnamed American university.

Professor Krzyz aka, Jean de la Croix,

is one of us who have at times been in a significant position waiting in the anteroom for an invitation to the Main Ballroom. One is never quite sure why the invitation does not arrive. There is always an abundance of reasons why—personality traits, race, class, education, or economics.

As the play opens, the audience is like a jury, listening to the prosecuting lawyer doing what good prosecuting lawyers do... framing issues and marginalizing the defendant. Along the way, we get a glimpse of university life from the inside, the cost of tenure, the importance of bubbles, and the *raison d'être* for the university.

Following the play, Jeffrey Seeman and Charles Gluchowski co-moderated a question and answer period with Professor Djerassi whose childlike enthusiasm and zest for everything is inspirational.



Carl Djerassi, Playwright; Charles Gluchowski, California Section Program Chair; Jeffrey Seeman, University of Richmond, Virginia Visiting Senior Research Scholar.

## *A few thoughts generated by Ebola*

The Governors of New York and New Jersey had instituted a mandatory 21 day quarantine on medical workers with possible exposure to Ebola and were returning from West Africa. The first person covered by this mandate was Kaci Hickox, a nurse volunteer with Doctors Without Borders who returned from Sierra Leone. Under some pressure from The White House, Governor Cuomo of NY modified his position saying that the quarantine would discourage workers from going to Africa, and helping. He then announced a slight easing of the restrictions....*workers can be quarantined at home.*

Governor Christie of NJ maintained that his quarantine requirements were still valid. At first glance it would seem that the NY and NJ Governors were taking a political position, i.e. any action that would help elect or reelect them or those they are supporting. Assuming that the Governors had asked for and received advice from their medical advisors, neither governor discussed or shared how they came to their decision. It is always possible that the right action is taken for the wrong reasons and visa versa.

Then Maine Governor Paul LePage entered the fray indicating that he would enforce the 21 day quarantine by requiring Nurse Hickox to remain in her home. You probably have read that Judge Charles LaVerdiere effectively reversed that quarantine mandate.

Of course that did not eliminate the circus-like atmosphere in the small Maine town. Reporters from all over the world are interviewing the Judge, Nurse, and neighbors. Reporters are asking questions such as, "What would you do if she came into the restaurant" and posing what-if scenarios like, if the quarantine had to be enforced, would the police dress up in protective gear to arrest her?



This circus is not unlike the Roman Circus, whose main function was to keep its population distracted from thinking about the real issues. Ruling regimes and leaders also learned from the Romans that fear is an effective tool to manipulate its citizens.

The national and international health science community says that a blanket quarantine of health workers would be counter productive in fighting the epidemic.

What is the best course of action? Is the solution best found in logic and science or do we appeal to the reptilian part of the human brain for answers.

Where are the leaders? It is not very comforting that the people on whom we depend for framing issues and discussions, the media, have conflicting agendas and know that the more drama and controversy that can be generated, the greater their monetary rewards. Our political leaders suffer from similar conflicting agendas... get elected, and serve their fund raisers.

The Ebola Epidemic is a wake up call on many fronts. How does the country and states deal with health dangers and the real fear of its citizens? Do we need a significant change in the for-profit health care industry? The current system can hardly be expected to have non-productive assets waiting for a crisis. Mt. Zion Health System in New York City is touting its new isolation ward along with a not so subtle request from its CEO asking the government and taxpayers for money to finance this new ward. By the way the facility is designed to handle a maximum of 5 patients at a time.

Once the US had an effective public health system that dealt with a number of contagious diseases like TB. Nothing like that exists today that can deal with a major epidemic. It seems the time is right for discussion and action.

Lou Rigali



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