THE VORTEX

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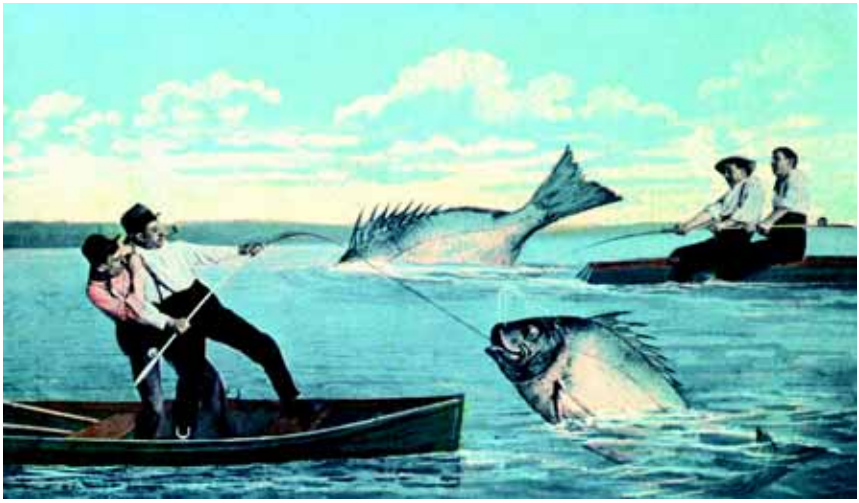

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Volume LXXII Jamuary 2011 Number 1

Chair's Message

Bryan Balazs

Having first chaired the California Section in 1998, I enthusiastically look forward to "having another go at it," while at the same time being extremely proud of the advances we've accomplished over this period. We have evolved from the practice of roughly one section meeting per month to an ambitious model of numerous events planned each month by our multiple committees, from well-attended Science Cafes, highly successful Women Chemists Committee quarterly meetings, numerous Family Science Night, National Chemistry Week and Chemists Celebrate Earth Day events per year, and a nascent Chico subsection with its own meetings and events, all while continuing our tradition of offering a monthly technical talk.

Our events have also broadened in scope to include visits to wineries and distilleries, discussions on topics such as coral reefs and art conservation, joint meetings with the Santa Clara Valley Section, and involvement with other organizations such as Bay Area science fairs, the American Institute of Chemical Engineers (AIChE), and the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE). In looking back at our activities in 2010, the list approaches almost 40 events offered to our members. Quite impressive!

Despite the current economic challenges, the California Section is very fortunate to be able to maintain our section office, staffed five days per week by the capable Julie Mason. We also have had great success in sustaining one of the ACS' most successful local section project SEED programs and, since the Educational Grant's inception in 1995, we have awarded almost $140,000 in these grants to equipment-starved high school science classrooms and labs. To further recognize excellence in teaching, we have also augmented our long-standing Petersen Award with additional awards for high school and community college teachers.

Our aim is to organize events and activities that support our members and the profession of chemistry, but it's time to take a step back and ask our broader membership, "Are we doing the right thing?" I ask for your help: Please let me know your thoughts on whether we have the right mix of activities, or

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January California Section Meeting

Speaker: Matthew G. Heberger, P.E.
Title: California Water: Crisis or Crossroads?
Date: Wednesday, January 19th
Time: Networking: 6:00-6:30 PM, Dinner: 6:30-7:30 PM, Talk:7:30-8:30 p.m., with time for questions.
Place: Washington Inn 495 10th Street, Oakland
Price: Buffet: Dinner: $33 (no charge for attending only the presentation)

Note that the Washington Inn is easily accessible by the 12 Street Oakland City Center BART station, and street parking is free after 6:00 p.m.

Reservations:RSVP by Friday, January 12th to the Section office by e-mail at office@calacs.org or call (510) 351-9922.

Abstract:

Water has become one of California's most polarizing issues, pitting North vs. South, farms vs. cities, and Democrat vs. Republican. Recent news is dominated by stories of drought, shortages, and pollution. Should the state spend billions on new dams and a Peripheral Canal? What can be done to reverse the collapse of once-vibrant salmon fisheries? Join Pacific Institute research hydrologist Matthew Heberger in a discussion on how insecurity over our most vital resource poses threats to our health, environment, and economy - and how we need to change the way we think about, use, and manage water in the 21st century.

Biography:

Matthew Heberger is a research associate with the Pacific Institute in Oakland, California. He has spent the last 13 years working on water issues as a consulting engineer, in water policy in Washington DC, and as a hygiene and sanitation educator in West Africa. He's currently researching issues related to water supply and water quality, water-energy connections, and the impacts of climate change on water resources. Matthew holds a B.S. in Agricultural and Biological Engineering from Cornell University and an M.S. in Water Resources Engineering from Tufts University in Boston and is a licensed professional engineer. The Pacific Institute is a non-profit, nonpartisan research institute that works to advance environmental protection, economic development, and social equity. See http://www.pacinst.org/

Cal Science & Engineering Festival

NEW DATE & LOCATION:
Sunday, January 23, 2011 11:00am to 3:00pm
Sutardja Dai Hall at UC Berkeley

Explore the wonders of science with free, fun activities for the whole family. It's all about science in action! You'll put solar power to the test, get hands-on with ancient fossils, turn cellulose into fuel, make your own earthquake, journey to the stars—and more! Also featuring a live performance by the acclaimed Banana Slug String Band! The Cal Science & Engineering Festival is hosted by Science@Cal, an initiative of the UC Berkeley Office of the Vice Chancellor for Research. Learn more by visiting the website,.science@cal.berkeley.edu.

The First Chemists (Part 2)

Bill Motzer

In the December 2010 Vortex, I described the characteristics of Egyptian blue (EB), which is chemically known as calcium copper silicate ($CaCuSi_4O_{10}$ or $CaO{\cdot}CuO{\cdot}4SiO_2$). EB was a pigment manufactured and used by the ancient Egyptians for about 3,000 years; it is considered by many archeologists and chemists to be the first synthetic pigment. To the ancient Egyptians - blue (which in ancient Egyptian is "irtyu") was the color of the heavens or the dominion of the gods, and also the color of water - revered because of the annual Nile floods brought life giving silts into the Nile valley. The ancient Egyptians also favored dark blue semi-precious stones such as azurite (ancient Egyptian name "tefer") and lapis lazuli (ancient Egyptian name "khesbedj"). These stones were highly prized, so much so, that they were imported at great cost across the Sinai Desert for jewelry and inlays.

Egyptian Blue Manufacture

What is intriguing about EB's manufacture was its compositional consistency over at least three millennia. (Were the ancient Egyptians also the first chemical engineers?) Recent chemical analyses of EB from archeological objects suggests a manufacturing process that included a multi-phase or a step-like approach by first mixing and then grinding its raw mineral components and then heating the mixture. The raw materials were either quartz sand or perhaps crushed quartzite pebbles (SiO_2), a copper mineral such as malachite [$Cu_2CO_3(OH)_2$] or bronze (copper-tin alloy) filings, calcium carbonate ($CaCO_3$), and a small amount of an alkali such as natron (a sodium bicarbonate mixture - see below). Depending on the degree to which EB was ground and subsequently heated, the color could vary from a rich, dark blue (for a coarse grind) to a pale, ethereal blue (for a very fine grind).

Heating of the mixture ranged between 800 and 1000°C for several hours (depending on the amount of alkali used). The result was EB (synthetic cuprorivaite), carbon dioxide and water vapor. In its final state, EB consisted of rectangular blue crystals mixed together with unreacted quartz and some glass. From the analysis of EB samples from Egypt

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January Historical Events In Chemistry

Leopold May

January 2, 1889
Roger Adams, a researcher in organic chemical synthesis, was born on this date. He directed doctoral theses of 184 students.

January 4, 1891
Henry H. Dow prepared bromine from brine on this date.

January 7, 1794
Eihardt Mitscherlich who did research on crystalline structure, catalysis, and benzene and its derivatives, was born on this date. He also discovered isomorphism.

January 9, 1868
Sören P. L. Sörensen, who was born on this date, is lnown as the "Father of pH", He conducted research on proteins, amino acids, and enzymes.

January 10, 1923
Chemical and Engineering News was started on this day as the bimonthly News Edition of Industrial and Engineering News. It was changed to CEN in 1942 and became weekly on January 6, 1947.

January 11, 1875
Frederick M. Becket, an inventor in electrochemistry and electrometallurgy, was born. He received more than one hundred patents covering a wide range of electric furnaces and chemical products, notably ferro-alloys, calcium carbide, and special chromium steels.

January 12, 1912 Konrad E. Bloch, who waas born on this date, was a researcher on cholesterol and fatty acid metabolism. He shared the Nobel Prize in Physiology and Medicine in 1964 with Feodor Lynen for their discoveries concerning the mechanism and regulation of the cholesterol and fatty acid metabolism.

January 13, 1780
Pierre J. Robiquet, who discovered asparagine with Nicolas-Louis Vauquelin, was born. He also measured the codeine content of opium.

J**anuary 14, 1851**
Ludwig Claisen, who developed reactions such as the condensation of esters and the rearrangement of allyl vinyl ethers, was born.

January 15, 1784
Henry Cavendish presented the quantitative composition of water before Royal Society on this date.

January 17, 1706
Benjamin Franklin, who was born on this date, was a researcher of electricity; an inventor, a statesman, and described marsh gas to Priestley.

January 18, 1861
Hans Goldschmidt, who discovered the alumino-thermite process (Goldschmidt Process) in 1893 and patented it in 1895, was born on this date. He was interested in producing very pure metals by avoiding the use of carbon in smelting but realized its value in welding.

January 22, 1936
Alan J. Heeger, who was born on this date, shared the Nobel Prize in Chemistry in 2000 with Alan G. MacDiarmid and Hidaki Shirakawa for their discovery and development of conductive polymers.

January 23, 1929
John C. Polanyi shared the Nobel Prize in Chemistry with Dudley R. Hershbach and Yuan T. Lee for their contributions concerning the dynamics of chemical elementary processes. He was born on this date and is a researcher using infrared chemiluminescence to follow excited reaction products.

January 26, 1881
Claude S. Hudson, who did research in the chemistry of sugars, was born on this date.

January 27, 1865 August F. Kekulé presented his benzene structure to Société Chimique, Paris on his date.

January 28, 1843 Henry C. Bolton, who was a writer and bibliographer of the history of chemistry was born. He studied the action of organic acids on minerals.

January 31, 1881 Irving Langmuir, who was born on this day, did research on surface chemistry for which he received the Nobel Prize in 1932 for his discoveries and investigations in surface chemistry. He introduced gas-filled tungsten lamps and the use of atomic hydrogen blowpipe for welding. He and Gilbert N. Lewis evolved the electronic theory.

(Continued from page 3)

whether we should be engaged in other events or services for our members. Examples of things that we have done in the past, but perhaps should reinvigorate, are technical short courses, connections to ACS Technical Divisions, career assistance, connections to other professional or civic organizations, recognition of the scientific achievements of local chemists, or other science or education activities. Your voice matters to me, and I would appreciate hearing your thoughts about the direction that the California Section should be headed.

My personal goal as Chair is to continue the growth in our section that I've observed over the past decade. I'm always open to your thoughts including criticisms. You can reach me at 925-423-5403, or at bb@llnl.gov.

Best Wishes for 2011, the International Year of Chemistry!

Dr Wally Yokoyama presiding at the November Section meeting with speaker Dr J. Bruce German at the USDA Western Regional Albany Research Laboratories.

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and elsewhere, it has been determined that the weight percentage of the materials used to obtain EB in antiquity usually ranged from:
60 to 70% silica (SiO_2)
7 to15% calcium oxide (CaO)
10 to 20% copper(II) oxide (CuO)
To obtain theoretical cuprorivaite, where only blue crystals occur, with no excess of unreacted quartz or glass formation, the following percentages would have been required:
64% silica
15% calcium oxide
21% copper oxide

Material Sources

Silica is the main component of EB, and although it is ubiquitous in desert sand dunes there are no known historical records that quartz sand found adjacent to EB manufacturing sites were used. Investigations by Dr. Jakcsh and his colleague's (see Part 1) found titaniferous magnetite [$Fe(Fe,Ti)_2O_4$] crystals in EB. This mineral is common in Egyptian desert sand and in EB samples collected from the tomb of Sabni who served as a crown governor for the territory of Aswan under Pharaoh Pepi II (6th dynasty: 2246-2152 BCE). Its presence in EB suggests that quartz sand, rather than flint or chert, was the silica source.

Calcium oxide was most likely not added on its own in the first manufactured EB and may have been accidently introduced as an impurity in quartz sand and alkali. However at some point in time, craftsmen involved in EB manufacture realized the importance of adding lime to the mixture. Its source was most likely from the abundant limestone ($CaCO_3$)that occurs in the Nile Valley.

Copper, the first metal to be mined by the ancient Egyptians and may have been derived from oxidized copper ores (such as malachite) that contained 10 to 12% copper. It was first worked cold because the first miners could not obtain the necessary heat to melt and cast the produced copper droplets. Later, as shown by crucibles found at the mines, extraction included some further refining and casing of ingots. Also used in EB production were filings from copper ingots, or from bronze scrap and other alloys. The Wadi Maghara region may have been an early copper source but some experts claim that it did not contain sufficient quantities of ore. Traces of copper workings occur at Buhen and ore in the eastern desert became available during the Middle Kingdom. The Sinai Desert copper mines may have been the result of the first major ancient Egyptian foreign forays resulting in expansion of the Egyptian Empire into southern Canaan.

In the Old Kingdom (2600-2480 BCE), very little evidence exists for the types and sources of copper ore used in EB manufacture. During the New Kingdom (~1570 BCE) the use of bronze in EB became more widespread. This has been determined from varying trace amounts of tin, arsenic, and/or lead found in analyzed EB. These trace elements are not common to the region's oxidized copper ore. It has been suggested that bronze scrap was used during the Late Bronze Age because readily available copper ore reserves had been depleted requiring importation.

Natron occurs as mixture of sodium carbonate decahydrate ($Na_2CO_3 \cdot 10H_2O$, a type of soda ash) and about 17% sodium bicarbonate (also called nahcolite or baking soda, $NaHCO_3$); it also contains small amounts of sodium chloride (halite) and sodium sulfate. Natron forms under extreme evaporative conditions around salt lakes rich in sodium carbonate, common in many desert environments. In Egypt it is found in the Wadi El Natrun, in Chad along the shores of Lake Chad, and in Ethiopia's Showa Province.

In Part 3, I'll discuss other aspects of ancient Egyptian chemistry: they may have also been the first pharmacologists and they also manufactured perfumes and scents. One final thought: black (ancient Egyptian name "kem") was another color revered by the ancient Egyptians for the life-giving silt left behind by the annual Nile flooding and it was the ancient Egyptian name for their country (The "Kemet" or black land), which ultimately gave us the term chemistry. Because the rest of the ancient world revered and did not understand their chemical skills, did this also give rise to the term: "the black arts?"

December Meeting Report

James Postma gave his talk "Electric Car: Murder Victim, Suicide or Still a Gleam in its Parents' Eyes?" at Chico State at the meeting of the Northern California Subsection of the American Chemical Society. The title has a connection to the 1990's. documentary made about the General Motors electric car, the EV-1. The film suggested the EV-1 was a murder victim done in because GM did not want to compete with its own gasoline version. But Postma said the EV-1 had problems that soon would have caused it to fail (suicide). The conclusion: An electric car that will meet public expectations is still a gleam in the designers eyes. A major problem of electric cars is that batteries with a long life, are safe and relatively inexpensive are not yet available.

General Motors will introduce a so called electric car, the Volt. But Postma says it's really a hybrid, not a true electric car, because it depends on a small gasoline engine to recharge the battery.

When he thinks about the potential for electric cars, Postma is most interested in fuel There are fuel cells that run on natural gas and are used to generate electricity. But today's fuel cells contain dangerous liquids and safety is an issue. "We are stuck with cars having a limited range and using expensive batteries," Postma seems to be optimistic, and suggests that we just need a chemist or two for fuel cell breakthrough.

A link to the report written by Larry Mitchell staff writer for The Chico Enterprise-Record is http://www.chicoer.com/ci_16803820? source=email cells.

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Past Chair Paul Vartainian and the Section Office Manager, Julie Mason

The California Section looks forward to a new year with an ambitious list of innovative programs and events. Listed below and on our website, calacs.org, is a listing of the Section Officers and the Chairs of the various committees. The success of the section activities depends on Volenteers. Consider stepping forward and being an active part of the Section. Call Byran, Section Chair or any of the committee Chairs. Please note that there are also several specific committee openings

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September WCC Meeting Report

The Women's Chemists Committee hosted a seminar on Saturday, September 26, at Mills College. The title of the seminar was "Three Toxic Surprises in Everyday Life", presented by Caroline Cox. Caroline is the Research Director for the Center for Environmental Health (CEH) in Oakland, California. The case studies explored were: the proposed eradication of the light brown apple moth in California, the use of lead in purses, handbags and wallets, and pesticide residues in fruits and vegetables. Each presentation demonstrated how people can be unknowingly exposed to a range of potentially toxic chemicals through seemingly benign activities.

For eradicating the moth, the California Department of Food and Agriculture is proposing to spray an encapsulated pheromone-permethrin mixture over parts of California. There is substantial opposition to the proposal for various reasons including concern that permethrin is a suspected carcinogen and the supposedly inert ingredients in the mixture may not be inert to humans and wildlife. Lead in consumer goods has been in the news frequently in the past year. Caroline's CEH organization has successfully lobbied retailers to take more responsibility in removing these hazardous products from their stores. In 2007 a study showed that over 75% of the produce tested contained pesticide residue. Many of the pesticides are mutagenic and have reproductive effects in humans. In all three case studies, the speaker identified possible options to the toxins used. Chemists can contribute to creating safer products and practices in each of these areas.

The seminar was attended by approximately 45 people, several of whom are students in organic chemistry at Diablo Valley College. Caroline brought a portable XRF scanner to test handbags and wallets for lead, with surprising results. The WCC is grateful to have speakers of this caliber who can engage a diverse audience.

An under-reported group in the Section is The Womens Chemist Committe (WCC) Over the years the Chairs and members of this committee have organized outstanding events and programs. Please note that attendance at any of their events are open to all. Look to both the Section website and *The Vortex* for information to upcoming events. Thanks to Alex Madonik for documenting with picture some of the meetings.


California
Local Section


Trudy Lionel, Oana Leonte, Greti Sequin, Lisa Aguirre
Cal ACS WCC Meeting at Mills College
30 October 2010 © Alex Madonik

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