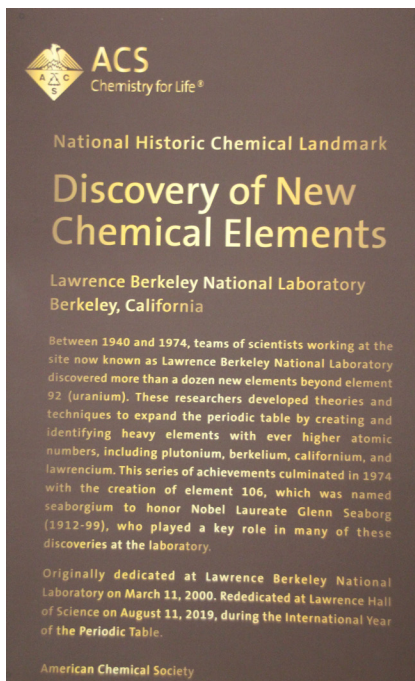


THE VORTEX

AMERICAN CHEMICAL SOCIETY
VOLUME LXXXI NUMBER 7

CALIFORNIA SECTION
SEPTEMBER 2019



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California Section American Chemical Society

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All are welcome

Saturday, October 19, 2019

Laney College
Odell Johnson Performing Arts
Theater
900 Fallon Street
Oakland, CA 94607

Time

2:30PM

Reservation and Payment Required

By one of the following options:

1. Brown paper tickets: go to www.calacs.org and click Many
2. Email office@calacs.org
3. Phone 510-351-9922

For either option #2 or #3, send a check for the desired number of tickets (indicating student or regular) made payable to: CA Section, ACS, 2950 Merced St., #225, San Leandro, CA 94577, postmarked no later than October 4, 2019. Individuals needing special assistance (ADA), allergies, etc. should notify CA Section ACS.

Cost

\$15 (\$8 for students and the unemployed)

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Susan Marie Frontczak

Many

This is a living history presentation of one of our most famous chemists, Marie Curie, and allows us to celebrate the International Year of the Periodic Table (IYPT) in grand style. The story starts with childhood memories that include Marie's dawning interest in science and her determination to conquer obstacles to obtaining an education in politically oppressed Poland - where women were not allowed to obtain schooling after gymnasium (high school). It then traces her migration to the Sorbonne, her unconventional romance with Pierre Curie, the birth of their first daughter, and the basis of Marie's scientific investigations that led to the discovery of two new elements (polonium and radium), an understanding of radioactivity, and the use of radium therapy against cancer.

About Susan Marie Frontczak

In dramatizing the life of Marie Curie, Susan Marie pays homage to their shared Polish heritage. Marie Curie's perseverance in purifying a tenth of a gram of radium from a ton of pitchblende, in part, inspired Susan Marie to earn an Engineering degree from Swarthmore College and a Masters in Software Engineering from the Wang Institute of Graduate Studies. She worked for fourteen years at Hewlett-Packard Company before pursuing full time writing and performing. It is her aim to reveal the human behind the scientist, while placing Marie Curie's life and accomplishments in a memorable historical context.

About your Role

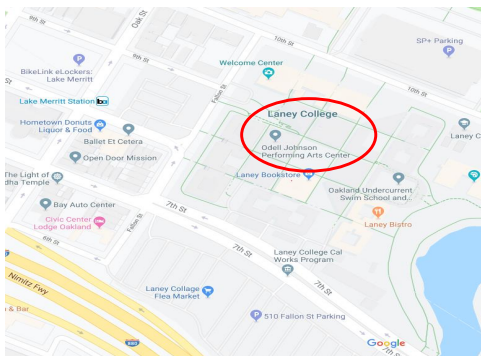
As attendees, you will be invited to participate in a networking event immediately following the performance. Students have a chance to win a prizes, so don't miss out!

Directions

Go to Laney College's website to chart the most suitable route

Parking: Free on Saturday on the Laney College campus

Public Transportation: Lake Merritt BART station is within walking distance to Laney College.



Gifts & Donations

The Section has many outreach programs with Section Committees such as WCC that help support science and chemistry in our community. You can help support the programs including the work with the High School Chemistry Teachers programs through your donations. Call or email and direct your valued contribution to a program of your choice.

Lou Rigali, LR101898@aol.com

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Cal-



Chair's Message

I hope all of you enjoyed your summer filled with rest, vacations, and maybe even managed to do a little work.

The California Section members were busy over the summer as we recently celebrated the International Year of the Periodic Table at the Lawrence Hall of Science. You can read about the event in this issue of the Vortex. We also co-sponsored another "Chemistry and AI" event titled "Challenges with Ultra-Large Data Libraries" event with Atomwise in San Francisco. This event featured panelists Ajay Jain and John Irwin from UCSF, as well as Jennifer Listgarten from UC Berkeley. This topic continues to garner interest from both academics and industry so we will attempt to schedule another event in late Fall.

There are two events to bookmark on your calendars. First is October 19th at Laney College, a living history presentation of Marie Curie by Susan Marie Frontczak.

This event is co-sponsored with the WCC. Second event date is November 8th at Merck's South SF auditorium: First ever Bay Area Chemistry Symposium sponsored by California ACS, Silicon Valley ACS sections, and many companies involved in pharmaceutical research. This event is open to graduate students as well as people in industry interested in learning about chemistry in the field of pharmaceutical research. Keynote speakers for the 2019 edition of BACS are: Carolyn Bertozzi (Stanford), Richmond Sarpong (UC Berkeley), and Bill DeGrado (UCSF). Details for both of these events will be outlined in detail on the webpage (calacs.org) and registration is required for these events.

We are also preparing for our election season so if you are interested in being involved, attend our executive committee meetings or feel free to reach out to any of our executive committee members.

Stay tuned for additional activities by checking out our webpage calacs.org or our tweets @CaliforniaACS.

Sincerely,
Patrick S. Lee Ph.D.



Cal ACS has shown up for the Bay Area Science Festival since their very first season in 2011, and this year we will return to North Bay Science Discovery Day in Santa Rosa on Saturday, October 26th, 10 AM to 4 PM.

CELEBRATION OF THE INTERNATIONAL YEAR OF THE PERIODIC TABLE BY THE CALIFORNIA SECTION.

Attila Pavlath, Marinda Wu and Lee Latimer.

On August 11, the California Section had one of its most well-attended meetings this year (standing room only!) at the Lawrence Hall of Science in Berkeley. It attracted even the involvement of the ACS National Historic Chemical Landmark (NHCL) program by rededicating and updating the Landmark plaque given in 2000 to the Lawrence Berkeley National Laboratory (LBNL) for the discovery of the transuranium elements. Many people were involved for the outstanding success of this event which was attended by three members of the ACS Board of Directors (ACS President Bonnie Charpentier, Paul Jagodzinski and Lee Latimer) and two Past ACS Presidents (Attila Pavlath and Marinda Li Wu).

The planning for the celebration started last year when the ACS International Chemical Sciences Chapter in Hungary,

in 2011 to show the benefits of chemistry in our everyday lives. This time, the goal was to show the benefits of the individual elements. With the help of a visiting Fulbright Scholar, Prof. Arwyn Smalley of Saint Martin University, Washington and her students, this was done by the end of 2018 with the creation of 32 excellent colorful posters, mostly in layman language.

The question was how to use them to celebrate the International Year of the Periodic Table (IYPT). Drs. Marinda Wu and Attila Pavlath then put together an ACS grant application on how to do this. The grant was approved and the California Section also allocated funds to have the new posters printed for display. That started a long process which would not have been successful without the involvement of many people.

While we searched for a central place in the Bay Area to have a meeting and display the posters, steps were taken to display the posters outside the area to give the posters more publicity too. Elaine Yamaguchi persuaded the Chemistry Department of the University of California at Merced to have a celebration with these



which was helpful for the celebration of the International Year of Chemistry in 2011, was again contacted. The idea was to create a similar series of posters as was done

posters. Our Chair-elect Prof. James Postma also hosted a similar meeting at California

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It's Elementary (Part I)

Bill Motzer

By now you should know that this year marks the 150th anniversary of the Russian chemist Dmitri Mendeleev's publishing, in 1869, of the modern periodic table (see *Chemical & Engineering News*, January 7, 2019, pp. 26-29). Thus, 2019 has been dubbed as the "International Year of the Periodic Table" (IYPT) (see February 14, 2019 C&EN, p. 4). Subsequent C&EN issues have had interesting articles and essays on different elements (see C&EN August 5, 2019, pp.30-43). Additionally, excellent articles on the elements are also in past *Vortex* issues by Evaldo Kothny, in his column ELK-N-ACS, with a directory of past articles in the June 2011 issue, pp. 6-7.

Mendeleev's 1869 table incorporated the then known 56 elements, including 10 elements known to ancient civilizations such as the Egyptians and Chinese (see *The First Chemists* in the December 2010 and January-February 2011 *Vortex* and *Mysteries of Chinese Purple* in the March-April 2012 *Vortex*), and the ancient Indus. For their time, the "ancients" had an incredible chemical knowledge, and in fact the root word (etymology) for chemistry is believed to have its origins in that the ancient Egyptians were known as "the Khemet" (people of the black land). In Arabic this became (al) kemy; translated into Greek – Khemeiea, in Latin – chimista, and finally in English – chemistry. To the ancient world, the Egyptians were masters of the "art" of chemistry.

The ten elements known to antiquity are listed below from the oldest (earliest) known archeological discoveries and uses to the youngest (latest):

- (1) Copper (Cu; Z=29): occurs as a native metal and sulfides. The earliest estimated use is around 11,000 years ago (ka) in Anatolia (Turkey). Cu beads and pendants found in Çatal Höyük, Anatolia date from about 9 ka. The oldest evidence of Cu ore smelting

is 7 ka from the archaeological site of Belovode on Rudnik mountain in Serbia.

- (2) Lead (Pb; Z=82): generally, occurs as sulfides, e.g. galena (PbS). Smelting began approximately (~) 9,000 ka; however, the oldest known Pb artifact occurs as a statuette in the Osiris temple at Abydos Egypt dated around 5.8 ka.
- (3) Gold (Au; Z=79): is found as native metal. Pure Au is extremely rare with most Au generally alloyed with silver (Ag) and some Cu; this is known as electrum. The earliest known use was before (>) 8 ka with the oldest existing sample from Nahal Quana an intermittent stream in Israel and the West Bank, the northernmost tributary of the Yarkon River.
- (4) Silver (Ag; Z=47): found as sulfides and sulfide mixtures such as argentiferous galena. Generally believed to have been discovered >7 ka with its earliest use ~6 ka from Asia Minor, just after Cu and Au smelting.
- (5) Iron (Fe; Z=26): naturally-occurring native Fe is rare; however, it's found in iron meteorites in combination with ~7.5% nickel. Archeological evidence indicates use >7 ka. Discoveries of meteoric Fe beads in Egypt ~6 ka. Fe ore smelting began ~3 ka with the iron age beginning in 3.2 ka with the use of Fe for tools and weapons.
- (6) Carbon (C; Z=6): occurs as charcoal, coal, diamonds, and graphite. The earliest known use charcoal use (~ 5.5 ka) was for the reduction of copper, zinc, and tin ores in bronze manufacturing, by the Egyptians and Sumerians. The oldest existing carbon sample are at 4 ka. Diamonds were probably known as early as 4.5 ka.
- (7) Tin (Sn; Z=50): the primary tin ore is cassiterite (SnO₂). The smelting of Sn in combination with Cu ushered in the Bronze Age at ~5.5 ka. An ancient

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cassiterite mine at Kestel, in southern Turkey, produced ore from 5.25 to 3.8 ka. The oldest known bronze artifacts date from ~4 to 4.5 ka.

- (8) Sulfur (S; $Z=16$). occurs as native sulfur in many areas of active volcanism. Sulfur was mined by the ancient Romans and Greeks, mostly by slave labor. An excellent semi-historical film "Barabbas" (1961), starring Anthony Quinn, shows him condemned to work in the sulfur mines of Sicily. Sulfur was first used ~4 ka and according to the ancient Egyptian medical Ebers Papyrus, sulfur ointment was used for granular eyelid treatments.
- (9) Mercury (Hg; $Z=80$): the primary Hg ore is cinnabar (HgS) found in hot or thermal spring areas mostly in volcanic terrain. Hg ores were mined

at Almaden, Spain by the Romans from ~2 ka for pigment and mercury. Although native Hg does occur, Hg recovery is relatively easy from roasting cinnabar, which drives off sulfur, oxidizing as SO_2 . Hg was found in Egyptian tombs dating from 3.5 ka. In ancient China, native Hg was believed to have been used to simulate waterways and seas in the Mausoleum (constructed over 38 years, from 246 to 208 BCE or 2.246-2.208 ka) of the First Qin Emperor (see Terracotta Warriors).

- (10) Zinc (Zn; $Z=30$): occurs as the mineral sphalerite (ZnS). It has been used in brass, an alloy of Cu and Zn perhaps as early as 5 ka but generally >3 ka by Indian metallurgists. However, its true characteristics were not well understood in ancient times.

In future articles, I'll discuss some of the newer theories about element origins.



Volunteers Needed

Cal ACS returns to the Solano Stroll in Albany/Berkeley on Sunday, September 8th, 10 AM to 5 PM, for a day of hands-on science and engagement with the community. As in past years, our booth will be located near the corner of Fresno Avenue, towards the top of Solano Avenue. We'll be there to set up around 9 AM; the fun begins at 10 AM with a parade (featuring many community organizations and political leaders) and the arrival of the first crowds of visitors. If you'd like to help out, please contact Alex Madonik, National Chemistry Week Coordinator for the California Section: alexmadonik@sonic.net or 510-872-0528



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State University Chico.

Unfortunately, we had difficulties finding an attractive place for the local Bay Area IYPT celebration. Several potential science museum sites were approached. Then Igor Sobolev persuaded David Seaborg, the son of Glenn Seaborg, to use his connections to approach the Lawrence Hall of Science (LHS). After initial exchanges of e-mail messages, we met with their leadership to work out the details for the celebration to join one of the public Fun Days on Sunday, August 11th at LHS.

The event received an unexpected benefit by the alertness of Dr. Lee Latimer. He discovered that the Landmark plaque on the discovery of the Transuranium Elements which was presented in 2000 at LBNL was in storage partly due to a need to update the information. In addition, the plaque at LBNL was in a restricted area and not accessible by the general public. With encouragement from Paul Jagodzinski, ACS District VI Director and chair of the ACS Board Committee on Public Affairs and Public Relations that oversees the Landmarks committee, Lee contacted the National Historic Chemical Landmark (NHCL) program, and was instrumental, together with Sophie Rovner from the ACS Landmarks office/ in getting their support to prepare the new proper plaque. Discussions with LHS and LBNL led to the plaque installation at LHS for easy public access. The plaque wording was updated through work with the staff at LBNL and the ACS Landmarks committee. An identical plaque is being prepared for display inside LBNL. This rededication of the NHCL was added to the IYPT program followed by a

modest reception sponsored by the NHCL program.

After this long preparation by many from the California Section working with the Hungarian Chapter, the Lawrence Hall of Science leadership and representatives from LBNL, the final program was prepared to celebrate IYPT and the NHCL at the Lawrence Hall of Science.

The program attracted over 125 people, some of them as last minute drop-in guests. Linda Wraxall and Sandy Tillin had their hands full checking in the crowd. The program started with the welcome on behalf of LHS by Dr. Yumi Nakagawa, Chair of the LHS Advisory Board, followed by UCB Physics Prof. and Dean of Math and Science, Frances Hellman, on behalf of the UC Berkeley campus. Prof. Hellman is also the President of the American



Physical Society and she elaborated on the importance of the Periodic Table in physics. Prof. James Postma, CalACS Chair-elect, greeted the dignitaries who were present and summarized how the periodic table was created by Mendeleev 150 years ago and how it expanded into its present form with 118 elements.

This led into the main events of the program. First, David Seaborg gave an entertaining talk about Dr. Glenn Sea-

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Professor James Postma



borg's life (his father) and work as a team leader in pioneering the discovery of the transuranium elements in the research at LBNL. This was followed by Dr. Korey Carter's presentation briefly summarizing work at LBNL today. Finally Dr. Attila Pavlath introduced the 32 posters displayed. He elaborated briefly on their main goal: to show the public the many benefits of the elements in our life. They can be downloaded from the webpage created for this: [www.](http://www.elementsinyourlife.org)

[elementsinyourlife.org](http://www.elementsinyourlife.org) and he urged the audience to use the information in other interactions with the general public. The poster set has been donated to LHS to help their activities in popularizing chemistry.

The meeting was closed by Dr. Bonnie Charpentier, ACS President, who explained the importance of the ACS National Historic Chemical Landmark program. Dr. Charpentier then asked Drs. Nakagawa and Latimer to unveil the plaque. Numerous pictures were taken by Norman Wu and others, including the LHS photographer. During the reception, the audience was able to review the posters at their leisure.

Overall, this event was made possible by the diligent work of many people, including members of the California Section and the Lawrence Hall of Science. The California Section is planning similar events to promote the public image of chemistry. One possibility is to consider presenting the other set of posters created for the celebration of the International Year of Chemistry in 2011 which did not receive enough publicity at that time, but has eternal value. If you are interested in helping with this, you can view them at www.chemistryinyourlife.org and contact the California Section.



WCC June 1 Meeting Report: Health of Coral Reefs

Nicki Davis and Patrick Lufkin

Dr. Rebecca Albright of the California Academy of Sciences presented her ground-breaking research on ocean acidification and the impact of changing seawater chemistry on coral reef biology, ecology, and biogeochemistry. Approximately 35 people attended the event, which was followed by an informal pizza lunch. Chevron is thanked for donating the use of its facilities.

Dr. Albright began by describing coral reef ecosystems and their critical role in the world economy. These ecosystems are founded on reef-building corals, which build their hard exoskeletons from calcium carbonate extracted from seawater. Although coral reefs occupy only 0.1% of the ocean's surface, they support 30% of known marine life. Millions of people depend on coral reefs for food, to shield their shorelines from destructive wave action, and to attract tourist revenue.

Unfortunately, coral reefs are in decline. Fifty percent have already been lost, and ninety percent are expected to be lost in the next 30 years. The primary threat is from the increasing concentration of atmospheric CO_2 that has occurred in the past century. The increase in CO_2 affects coral reefs in two ways: the higher temperatures increase the frequency of mass bleaching of coral reefs, and the increased acidity caused by dissolved CO_2 makes it more difficult for reefs to recover from bleaching and other stressors. Dr. Albright's research focuses on the effects of ocean acidification, known as "the other CO_2 problem."

Increased acidity pushes the equilibrium between carbonate and bicarbonate ions toward bicarbonate, thereby depleting the supply of carbonate ions that reef organisms use to rebuild. Eventually the system reaches a tipping point when the effects of erosion overcome the reef building process and the reef starts to shrink.

To date, much of what is known of the effects of seawater acidity comes from laboratory studies on captive coral species. Given the difficulty of doing controlled experiments in the oceans, little such work has been done on the net effects of global warming on entire reef communities. This is where Dr. Albright and her team come in; they conducted a series of controlled experiments "in the wild" under natural conditions on a living reef.

The researchers chose One Tree Island on Australia's Great Barrier Reef as an ideal location for their study. This atoll contains two small lagoons, which are submerged at high tide but isolated from each other and from the ocean at low tide. For an hour each day, seawater naturally drains across a reef from one lagoon to the other. To test the effects of acidification, the researchers changed the pH of the water in the upper lagoon and used a colored dye to track the flow of the treated seawater over the reef. They took samples from the water and used the data to calculate the amount of calcium carbonate taken up by reef organisms, called net community calcification (NCC). The higher the NCC, the faster the reef is growing.

In one experiment, the researchers added sodium hydroxide to the seawater to simulate the lower acidity of 100 years ago. Under these conditions, NCC increased by 15%.

In a later experiment, they increased the pH to the level expected 100 years from now if carbon emissions continue to rise. The result was a 34% reduction in NCC, compared to the 15% reduction predicted from most lab studies.

Dr. Albright's experiments demonstrate that coral reefs are already growing more slowly than 100 years ago, and that the impact of increasing acidification might be greater than expected. Given the importance of coral reefs, it is imperative that we take steps to reduce CO_2 emissions and find ways to mitigate the effects of ocean acidification.



California Section Women Chemists Support Sonoma County's Expanding Your Horizons Conference

Janet Schunk

I know Spring has arrived when I head to Sonoma County to be a presenter at the Expanding Your Horizons' Sonoma County chapter annual conference. This year, the conference was held at Santa Rosa Junior College on Saturday, 06 April 2019. The conference is designed to introduce young girls, in grades 7 and 8 from Sonoma, Lake, and Mendocino counties, to the world of science, math, engineering, and other fields where high school math and science are required, through hands-on workshops.

The ACS California Section Women Chemists team consisted of Anne Taylor, Elaine Yamaguchi, and Janet Schunk. We presented three 55-minute workshops, Chemists Have Solutions, where paper chromatography and design of experiments were used to explore techniques used by chemists as well as talk about the scientific principles and how they might apply to various career options.

This year, we presented the workshop with a new twist. We still used paper chromatography, a technique used to separate mixtures, where our mixture was a black water-based marker, but we changed the design of experiment. The first experiment the girls performed was to determine what might be an ideal sample size. The girls were assigned to either Design 1 or Design 2, working with one brand of paper towels, two paper towel strips, and either given an old marker (>15 years) or a new marker (~3 years). They applied a small dot of their assigned marker on paper towel strip 1 and a large dot of their assigned marker on paper towel strip 2. Then the strips were placed in a tank with a small amount of water such that the water would wick up from the bottom of the paper towel, through the sample

spot and carry the ink dyes, separating "black" into its component colors. Based on the results of experiment 1, the girls then performed a second experiment, where they cut the paper towel sheet in different directions on the weave (lengthwise, crosswise, and diagonal) to create their strips, and used the sample size result from experiment 1 to apply the same size dot of marker on all three towel strips. The three paper towel strips were placed again in the tank with water to separate the marker into its dye components. The purpose of the second experiment was to ask the question if the direction of the paper towel weave impacted the separation or not.

While each experiment ran, Anne, Elaine, or Janet shared a bit about their educational and career journeys. This allowed the girls to hear how career and personal life do not always follow a straight path, and that detours and redirection are OK.

The workshop not only introduced the girls to a technique used by chemists, but it also introduced the girls to being collaborators. One scientist cannot run every possible experiment, but by sharing data with other scientists, they can get to a "solution" faster. And sometimes, having results that say there is no difference in performance is still important information to have for designing future experiments.

The California Section Women Chemists have been supporting Sonoma's chapter of Expanding Your Horizons conference for over 10 years. This outreach activity has been part of the Women Chemists Committee contribution to the California Section's Strategic Plan Goal 3: fostering excellence in chemical education.



BUSINESS DIRECTORY

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- www.mboservices.net
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