ACS Chemistry for Life®

SCALACS

A Publication of the Southern California Section of the American Chemical Society

VOLUME LXXIX/No. 4 MAY/JUNE 2024

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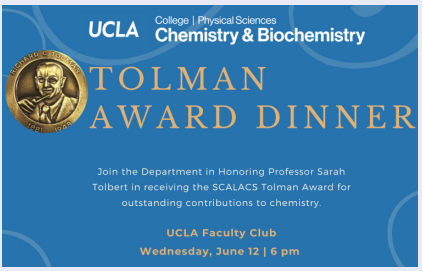

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THE NEXT ISSUE OF SCALACS WILL BE SEPTEMBER, 2024

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CHAIR'S MESSAGE

Hello everyone,

In the March magazine, I alluded to an event in February that dramatically affected the non-profit aerospace community and myself. The event is still playing out (and will be until 2026) and so I'd like to write another, different kind of message (again, more personal) than what is normally in the Chair's Message, related to the fallout of the February event. This and other personal events have caused me to reflect on the need to dust off my skills and develop new skills as a professional scientist.

My current (?) organization has decided to eliminate most biological, biochemical (astrobiology) and chemical research. Most biologists and chemists were forced out; most of them are re-inventing themselves as engineers of various flavors, renouncing their professional memberships and are moving on. I'm a biochemist, and it's time for me to reinvent myself. Again.

Again? Well, I didn't start out in the chemical sciences. My B.S. was in genetics and I worked in the biotechnology field during and right after college. But, an event similar to this past February's event, forced me to reinvent myself: as an analytical chemist! (I excelled in analytical, organic and biochemistry in college.) My gateway into the chemical sciences. I continued in the chemical sciences for the next 35 years.

When I went to grad school, I continued in the chemical sciences, this time protein chemistry and structural biology (even though my Ph.D. was in molecular and cell biology). Same with my postdoc in New Zealand and even back to the biotech world in Australia and the UK. I had planned to continue protein chemistry (astrobiology) when I joined my current employer 20 years ago but a lack of funding and facilities forced another, minor, re-invention: chemical instrument researcher/designer/builder for spaceflight.

Now, with the elimination of most research in my division, I need a major reinvention again. Not uncommon in this day and age, I suppose. Maybe I'll go into program management or line management. Or, back to industry. I'm sure this will be decided for me in the next 6-10 months. It's certainly happening to hundreds of my former and current colleagues and friends here in SoCal.

All the best,

Richard Kidd
Chair, SCALACS

Summary on SCALACS at the City of STEM & LA Maker Faire on April 6, LA Historic Park

The Faire was organized by the Columbia Memorial Space Center and supported by Los Angeles Public Library, Lollipop Labs, Clean Power Alliance (CPA), Calpine Energy Solutions, and City of STEM. It was a family and adult-friendly event attended by all who were interested in STEM including school children and their parents, teachers, engineers, scientists, and artists as well.

The SCALACS booth was located in one of the nine rows of exhibitor booths. In attendance at the booth were SCALACS Executive Committee members, Veronica Jaramillo, Krishna Kallury, and Lucky Morales. Angelina Lin (Brentwood High School), Stephanie Cheung (Westridge School for Girls), Erin Chong (UCLA), Brian Drouin (JPL), and Mackenzie Anderson (Pasadena City College) assisted at the booth.

SCALACS hands-on activities included acid-base and redox experiments using household chemicals and soft drinks and the design/function of batteries for energy generation. Utilizing red cabbage water extract as an indicator and the acidic constituents of fruits (and the juices derived from them) as standards, the pH of apple and lemon juice were tested by the students visiting the booth. Ammonia cleaner, baking soda, and washing soda were used as test bases. An invisible ink demonstration with phenolphthalein indicator was also shown. Vitamin C solution and iodine served as showcases for the redox experiment using cornstarch solution as indicator. HiC and Orange Gatorade were tested for presence/absence of Vitamin C.

The working principles of a battery were demonstrated by the volunteers using two metal plates as cathode (copper) and anode (zinc or aluminum) and a hand-sanitizer as the electrolyte. Visitors were asked to lay their hands containing the sanitizer on the two plates and the current generated is measured by a microammeter. When the electrodes were dipped in a non-conductor like sugar solution, no current was detected. However, a salt solution conducted electricity.

Krishna demonstrated the glowstick principle of redox reactions and also explained the periodic table and the significance of the elements. Volunteers Angelina and Stephanie handled the demonstration of acid-base and redox experiments for the most part.

(Continued on page 3)

Summary Of Prof. Sarah Tolbert CCEW Seminar by SCALACS on April 25, 2024

At the outset, Krishna Kallury explained the origins of Chemists Celebrate Earth Week (CCEW) and the mission of ACS in promoting the role of chemistry in tackling the problems we face in our daily lives. He then introduced the speaker to the audiences.

Sarah commenced her presentation by summarizing the current state of energy generation and consumption, especially in California. Our state utilizes solar energy cells and wind turbines as alternate energy sources to combat climate change attributed to green house gases, principally by the transportation sector. She emphasized the need for lower cost batteries with the attributes of long lifetimes, easy recyclability, fast charging and higher capacity. Her group's research focuses on developing battery materials that enable fast and regenerative electric storage. She described the long charging times an electric car takes when plugged in residential and commercial settings and the problems of apartment dwellers. She then proceeded to explain current battery technologies viz. alkaline and acid battery designs, nickel-metal hydride and lithium-ion batteries. The fundamental difference with lithium batteries, is that only lithium moves while all atoms move in others.

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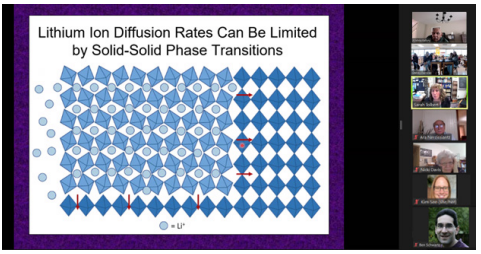
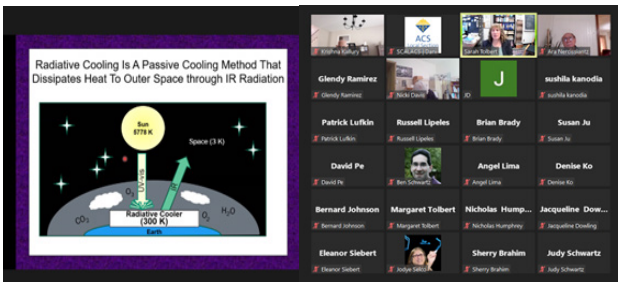
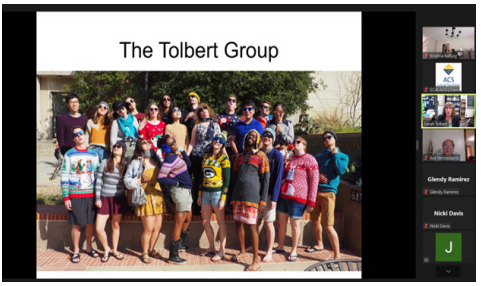






(Continued from page 2)

It was so amazing to see such young children so passionate about science. I remember distinctly one little girl who was barely tall enough to see over the table who proudly exclaimed, "I love STEM!" It was so rewarding to see her so happy and passionate about science. She also reminded me of my younger self and made the experience even more special. It was also incredible to work alongside such skilled scientists at the booth. I received a lot of guidance and advice on how to dive deeper into science which was incredible.

~Volunteer Angelina Lin, Brentwood School

I loved volunteering at the STEM Fair booth on Saturday! The kids were so interested in Science and were particularly attracted to our booth because we had intriguing hands-on experiments. Having all the bottles displayed and colorful pH definitely peaked their interest as they walked by our booth. It was so cool to see young kids so interested in STEM and eager to learn! Many took packets and thoroughly enjoyed the experiments. I'm so grateful to have had the opportunity to take part in the STEM fair! Dr. Jaramillo was wonderful and let me lead experiments with the kids. She was kind and engaging. It was an honor to meet her! Thank you again for inviting me.

~Volunteer Stephanie Cheung, Westridge School for Girls

Many cool earth day activities can be found at:
https://www.acs.org/education/outreach/ccew/educational-resources.html

Celebrating Women in Chemistry: Educational Trends of Women in STEM

by **Eleanor D. Siebert, Ph.D.**

In the last issue of SCALACS, we found that Los Angeles County women account for only 1 in 4 of residents (16 years and over) who are working full time in science, technology, engineering, and mathematics (STEM) fields. Moreover, the median earnings of these women is only 88% that of men. Both the participation rate and earnings of women in STEM are in large part a function of their field of postsecondary academic study and the level of educational degree attained. In this article, we explore educational trends of women in STEM across the nation and Los Angeles County.

Only a small proportion of women and men who hold a bachelor's degree or higher have majored in STEM fields. Across the nation in the 2021-2022 academic year, more than 2 million bachelor's degrees were conferred; only 22% of those degrees were in STEM fields. The number of women receiving a bachelor's degree in STEM fields each year has increased over the past decade by about 60%, amounting to about 169,000 women in 2021-2022. The number of women who received a doctorate in STEM fields over the past decade has increased by 32%, to just under 12,000 women in 2021-2022.

In 2021-2022, across the U.S. women received 38% of all bachelor's degrees and 35% of doctorates conferred in STEM fields. Breaking out chemistry from other STEM fields, women earned 55% of bachelor's, 47% of master's and 43% of doctoral degrees awarded in chemistry. While gender parity in STEM fields will be reached when women earn about half of degrees at each level, these figures represent great strides for women across my lifetime: when I completed graduate studies at UCLA in1969, the share of women receiving doctorates in physical sciences and science technologies was 5% (compared to 34% in this specific category in 2017-2018)!

In recent years more Los Angeles County women hold a bachelor's degree in science or engineering than their predecessors. One way to view this is to break out the proportion of women holding a bachelor's degree in science and engineering by age groups. Among women who are 65 years and over, only 1 in 4 (24%) with a bachelor's degree majored in science or engineering, while among women 25-39 years of age, 1 in 3 (32%) with a bachelor's degree majored in science or engineering.

The increasing participation rate of women in postsecondary STEM majors bodes well for increased representation of women in STEM careers. With a greater proportion of women earning university degrees in science and engineering, more women will be prepared to enter the science and engineering labor force. And with more women earning a master's degree or doctorate, these women will be eligible for higher earnings—perhaps leading to earnings parity with men. Stay tuned!

Notes:

Data for Los Angeles County women were taken from the U.S. Census Bureau, 2022 American Community Survey 1-Year Estimates. National data are from the latest edition of the Digest of Education Statistics, National Center for Education Statistics, and apply to postsecondary institutions that participate in Title IV federal financial aid programs.

If you are interested in reading more about the general status of women in California or Los Angeles County, please visit the Mount Saint Mary's University, Center for the Advancement of Women website at www.msmu.edu/CAW

Summary on SCALACS Participation at the Engaging Girls in STEM Event at LA Zoo

This event organized by the LA County Office of STEM Education at the LA Zoo was conducted indoors due to the rain. Middle and high school girls from the LA County area schools were divided into two batches of 100 students each. One batch visited the booths during 9:45 to 10:45 am and the other batch from 11:15 am to 12:15 pm. During the interval from 10:45 to 11:15 am, two presentations were given by high school students, Angelina Lin and Julia Bustos on their research work on Caenorabditis elegans and small cell lung cancer topics, respectively.

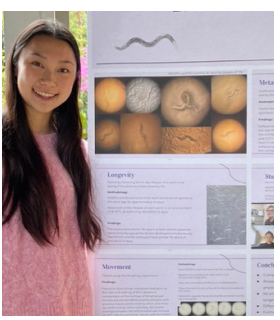
Booth demonstrations were carried out by the high school girls under the supervision of SCALACS Executive Committee Members Veronica Jaramillo and Krishna Kallury. The experiments carried out included acid-base and oxidation-reduction concepts and household chemicals were used for the experiments. Examples of acids included apple and lemon juice together with their main acidic components malic acid (apples), tartaric acid (grapes) and citric acid (citrus fruits) and vinegar. Bases used were baking soda, washing soda, sodium benzoate (food preservative) and ammonia cleaner solution. The indicator was red cabbage extract. In addition, using phenolphthalein indicator and ammonia, an invisible ink demo was also shown. The reducing properties of Vitamin C and the oxidant iodine tincture solution were used to demonstrate redox using corn starch indicator. And, the elements of the periodic table were discussed and handouts of wallet size periodic table cards were given away to each student with the help of SCALACS Executive Committee Members Lucky Morales and Jessica Lu.

The SCALACS booth was well attended, with almost all students registered for the event passing through. At the conclusion, “Thank You” cards/notes were given to each of the 20 booth personnel by Laura Schafenacker of the LA County STEM Education Office.

We thank those below who assisted at the SCALACS booth:

SCALACS Executive Committee: Veronica Jaramillo, Krishna Kallury, Lucky Morales, Jessica Lu
Volunteers and presenters: Angelina Lin (Brentwood High School), Julia Bustos (Fransico Bravo Medical Magnet School), Naomi Xia (Santa Monica High School),

Presenter Julia Bustos



Presenter Angelina Lin

BY

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Previous editions of this column have explored the doctrine of fair use in copyright law, including permissible copying in the educational setting and the scope of potential rights retained by authors pursuant to copyright transfer agreements. In connection with the latter topic, reference was made to the ACS Journal Publishing Agreement and its list of permitted uses by authors, including use in theses and collections of their own works, teaching and training, and presentations at conferences and seminars, for example.

What should someone do if they want to use a copyrighted work in some way but (1) they do not own the copyright, (2) it appears that the doctrine of fair use does not apply, and, (3) for a work they authored, they have not retained the right for the use? They should ask for permission from the copyright owner.

This is subject to an important caveat. Suppose the person bought a copy of a copyrighted work from the copyright owner and now wants to sell or otherwise dispose of the work. Does the person have to seek permission from the copyright owner? Generally, the answer is "no." In general, the Copyright Act provides that the owner of a particular lawfully-made copy of a work may sell or otherwise dispose of that copy without seeking or obtaining permission from the copyright owner. This is known as the "first sale" doctrine. Although it has some significant exceptions—beyond the scope of this article—for sound recordings and computer programs, the doctrine generally holds that the first lawful sale of the copy exhausts the copyright owner's interest in the copy itself. Importantly, the sale does not exhaust the copyright owner's right to make more copies, and it does not authorize the buyer to make copies of the copy.

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The author earned engineering and chemical engineering undergraduate and graduate degrees, and is a patent attorney and partner at the law firm of Irell & Manella LLP. This column does not constitute legal advice and does not necessarily reflect the views of the firm or its clients.

THIS MONTH IN CHEMICAL HISTORY

BY

HAROLD GOLDWHITE
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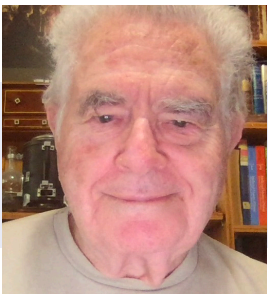


I continue to look back skeptically at the new chemistry of 90 years ago as allegedly reflected in the pages of *The Chemical Society's Annual Report* for 1934 (Volume XXXI) published in London in 1935. Here are a few of the most surprising results reported.

Work by Bettis and Kramer on the synthesis of the elusive cyclo-octatetraene, the eight-membered ring analog of benzene, has apparently proceeded with (limited) success with an overall yield of 0.37% from the starting material of a butadiene dimer. The new hydrocarbon was obtained as orange prismatic crystals with a melting point of 84°C. A limited number of chemical explorations have shown the new compound to be reactive towards a variety of both electrophilic (HNO_3, H_2SO_4) and, surprisingly, nucleophilic ($NaNH_2$) reagents, although, because of the extremely small amounts of material available the products of these reactions have not yet been identified. The ultraviolet spectrum of the new compound is extraordinary with numerous sharp absorption bands throughout the near and usual u.v. regions.

Further study of reduction reactions with potassium in liquid ammonia have been reported by Vandelay and Seinfeld. Hexachlorobenzene yields approximately 37% benzene; 48% naphthalene, 16% anthracene, and 21% of as yet unidentified polycyclic and partially chlorinated apparently aromatic hydrocarbons. The fact that these reported yields add up to over 100% has not gone unnoticed by this journal's reviewers and does cast doubt on the care used by the reviewers of the original article that appeared in the *Journal of the Alternative Herzegovinian Academy of Agriculture Related Research.*

A new analytical tool of apparently remarkable utility in investigating complex organic systems has been reported by Gervais. There can hardly be a practicing organic chemist who is unaware of the ubiquitous "whirling Dervish" chromatographic apparatus that has taken the organic chemistry community by storm. It is hard to realize that this piece of analytical equipment was invented only a year ago. For the miniscule proportion of the unenlightened the apparatus consists of a circle of filter paper suspended horizontally from its center, fed by a reservoir of the developing liquid (usually an aqueous solution) and spun at ultra-high speeds so that centrifugal force greatly accelerates the development of the chromatogram. Reports of the successful application of this new method have appeared from groups as varied as those studying animal and human steroids; hormones; peptides; and plant pigments. (Is a Nobel Prize in the near future likely?)

The numbers of theoretically possible structural isomerides in a series of aliphatic compounds, though seldom required for stereochemical purposes, are of some interest as giving perspective. The following are from the calculations of H. R. Henze and C. M. Blair for saturated hydrocarbons.

# Carbon Atoms	**5**	**10**	**15**	**20**
# Isomers	**3**	**75**	**4347**	**366,319**

(This one is accurate!)

2024 U.S. NATIONAL CHEMISTRY OLYMPIAD

This year we had 610 students representing 25 schools for the High School Chemistry Olympiad. Testings took place on March 13 and 14. Twelve qualified students were invited to take the National Exam on April 20 at Cal State Dominguez Hills.

Thank you to Gerald Delker and Barbara Belmont, SCALACS Olympiad Councilors and Huntington Association Management team for their assistance, as well as the schools that volunteered to host students from schools that had fewer than 10 participating. We appreciate the help of these teachers who took in the additional students in their area:

Altair Maine - North Hollywood High School
Wonjong Kim - Boston Education
Anna Mkrtchyan-Antonyan - Anderson W. Clark Magnet High School
Cherryl Mynster - Arcadia High School
Benjamin Ku - South Pasadena High School

The 12 students who took the National Exam on April 20 at Cal State Dominguez Hills:

Herrick Wang - Arcadia High School
Evan Yen - Arcadia High School
William Putzer - Harvard-Westlake High School
Remy Kushner - Harvard-Westlake High School
Connor Zhao - North Hollywood High School
Daniel Rosado - Redondo Union High School
Tristan Lu - Redondo Union High School
Max Zhou - San Marino High School
Michael Lee - South Pasadena High School
Gihan Van Kerkhove - South Pasadena High School
David Zhang - Temple City High School
Saket Pamidipathri - The Science Academy STEM Magnet

Photos courtesy of Barbara Belmont, SCALACS Secretary/Treasurer.

Congratulations to all! This year, we will be hosting an in-person (by-invitation only) **High School Chemistry Olympiad Awards Ceremony** on **May 24.**

(Continued from Page 3)

All batteries consist of a cathode and anode together with an electrolyte. During charging, electrons move from cathode to anode and their flow back to the cathode generates electricity. In lithium-ion batteries, these electrodes are coated with a layer of carbon and their crystalline structures govern these movements. Energy density and power density are the factors that control the performance of a battery. We need to keep all the energy generated while achieving superfast movement of lithium for rapid charging. Nanoporous (or "holey") materials possess the architecture needed for these objectives. Polymer-metal composites were synthesized and by thermal removal of the polymer, nanopores were generated. These possess short diffusion lengths and little to no face transition properties.

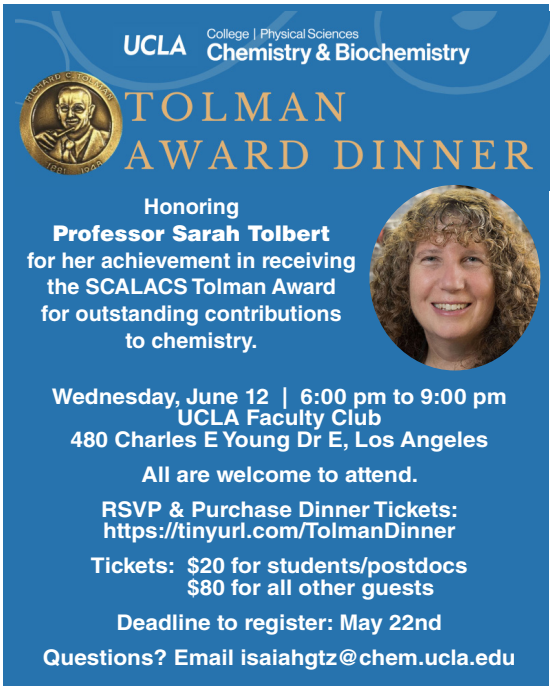
Molybdenum oxide and molybdenum sulfide nanoporous materials were investigated by galvanostatic profile studies and cyclic voltammetry. Molybdenum sulfide demonstrates an amazing time of 36 seconds to get to the half charging capacity level with no phase transitions. After 10,000 cycles, it still retains almost all its capacity.

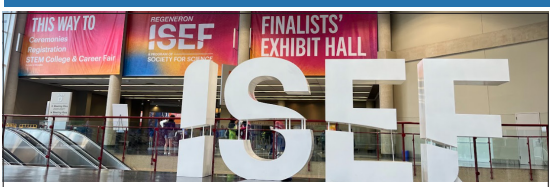
Another intriguing study by Sarah's group was on the generation of cooling using natural sunlight. With nanoporous silicon dioxide, absorbance of sun light followed by radiative energy transfer into space results in cooling that can be utilized in temperature control of buildings and other structures. Sarah has set up an enterprise that is working on converting this discovery into practical usage as well as on the energy storage properties of the molybdenum sulfide observed.

At the end of the seminar, Sarah indicated that there are summer programs for high school students about nanoporous technology. Visit https://cnsi.ucla.edu/k-12-students/ or more information. Her group is also working on the development of sodium ion batteries to achieve more economic viability.

To view the recording of the seminar, visit:
https://www.youtube.com/watch?v=7Px7SDr65b4

Dr. Edye Udell, SCALAC's immediate past chair will be presenting at the 2024 International Coalition of Girls' Schools Conference happening on June 24 - 26 in Baltimore. More information can be found here:
https://girlsschools.org/professional-development/icgs-conferences/





Regeneron ISEF 2024 will take place in Los Angeles from May 11-17, 2024 at the Los Angeles Convention Center. Regeneron ISEF 2024 is an in-person event with all finalists competing in-person. For more information on volunteering and sponsorship, visit https://www.societyforscience.org/isef/

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PERIODICALS

ATTENTION SCALACS MEMBERS!

Beginning January 2025, the *SCALACS Magazine* will be going 100% digital as the default delivery mode. *SCALACS Magazine* has been available in digital form since 2010, but we continued to send print issues to a subset of members. If you are currently receiving a printed version of the *SCALACS Magazine* and wish to continue receiving the SCALACS Magazine in this form, please e-mail **office@scalacs.org** by **November 15, 2024.**

IMPORTANT DATES

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