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presented by
Prof. Sarah Tolbert, UCLA (2023 Tolman Award
Recipient) • Thursday, April 25 at 4 - 5 PM

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SCALACS

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

Volume LXXIX

APRIL 2024

Number 3

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CHAIR'S MESSAGE



Hello everyone,

Last month I diverted my attention from some tragic events and talked a little bit about my life passion of exploration, its connection to chemistry, and finding your dream careers. There's more to the story and I hope to return to the topic again in the future.

As mentioned in the last issue of the magazine, the Tolman Award Committee has selected Professor Sarah Tolbert as the recipient of the Tolman Award for the year 2023 in recognition of her outstanding scientific contributions in revolutionizing design and function of materials by building nanoscale structures that combine synthesis and characterization approaches from the worlds of "soft" and "hard" matter. Congratulations, Prof. Tolbert! And, we are proud to announce the recipient of the 2024 Paul Shin Memorial Outstanding High School Teacher of the Year Award is Mr. Barry Vella of Venice High School. Our last recipient for this award was Caroline Morgan, Francisco Bravo Medical Magnet High School in 2017. So, we are very honored to be able to continue presenting this award. If you know a deserving high school chemistry teacher for this award, please make the effort to show them how important their work is to you and their students. It's teachers like the recipients of this award that make learning chemistry rewarding. Nominate them. Visit https://scalacs.org/?page_id=19 for more nomination information.

I'd like to return to one of my topics in the January/February magazine—science fairs. First up is the Los Angeles County Science & Engineering Fair (LACSEF) on March 10-11 (at the Shrine Expo Hall). This would have occurred right as last month's issue came out. Next up is the California Science & Engineering Fair (CSEF, <https://csef.usc.edu/>) on April 16, 2024, and it will be entirely online. I had previously reported that it would have been in-person but the recent move and stacking of Space Shuttle Endeavour in the (under-construction) Samuel Oschin Air and Space Center shifted the plans of the fair. This fair would have occurred right as this issue is released. But the Regeneron International Science and Engineering Fair (ISEF, <https://www.societyforscience.org/isef/>) organized and hosted by the Society for Science will be held on May 11-17 and will still be in-person at the LA Convention Center. ISEF is still looking for Grand Award Judges at <https://www.societyforscience.org/isef/grand-award/>. SCALACS and myself will be representing ACS as a Special Award Organization. I hope to see some of you there!

All the best,
Richard Kidd
Chair, SCALACS
Explorer



2024 Paul Shin Memorial Outstanding High School Teacher of the Year Award

This year, we are proud to announce that we have a recipient for the Paul Shin Memorial Outstanding High School Teacher of the Year Award—Mr. Barry Vella of Venice High School.

Barry attributes his successes in teaching to great mentors and to being placed at Venice at the right time. For 12 years, he was mentored daily by Richard Erdman, an extraordinary AP Chemistry teacher whose science bowl teams won two national titles in Washington D.C. Also, Venice's science chair, Priscilla Lee, working concurrently at UCLA, had just founded AP Readiness with Rich and Michael Morgan, Bravo High School's AP Chemistry teacher. The monthly program, now for 26 years, offers Saturday sessions where new teachers observe mentors presenting AP lessons to students. Barry attended this program as a mentee for 6 years, became an adjunct instructor in 2006, and continues co-teaching the UCLA program today with Larry Walker, Calabasas High Emeritus, who delivers inspiring Chemistry demos, analogies, and anecdotes.

Additionally, Barry has worked 4 years in UC Riverside's AP Readiness program, served 9 years as Venice's science department chair, mentored 15 new AP Chemistry teachers through LAUSD's NBC program, and recently worked for ETS grading the 2023 AP Chemistry exam.

Barry will be honored at our annual Educational Affairs Banquet / Chemistry Olympiad Banquet, which will once again be held in person on May 24 (by invitation only).

The winner of this award will also be entered at the National ACS level for the James Conant Bryant Award and the Western Regional High School Teacher of the Year Award.

"It gives me great pleasure to announce that the 2024 recipient is Barry Vella of Venice High School. Barry was a mentee of mine many years back and I am exceptionally proud of what he has accomplished in his career. I have had the pleasure of teaching with him at UCLA and presenting with him at several Chemistry Teachers Meetings."

~Michael Morgan, an Honors and Advanced Placement Chemistry teacher at Francisco Bravo Medical Magnet High School

2024 U.S. NATIONAL CHEMISTRY OLYMPIAD



We are proud to announce we have about 610 registered students from 25 schools around Southern California registered for the local exam. Students took their exam March 13 & 14. Answer sheets will be sent to USNCO where they will be processed by their grading system.

Top students will be selected to move forward to the National Exam on Saturday, April 20 at Cal State Dominguez Hills. SCALACS will send notifications to the teachers regarding this. Good luck to all students and thank you to all the teachers who coordinated and proctor the exams.

2024 IMPORTANT DATES

Schedule is subject to change. All changes will be posted on the USNCO website.

April 20, 2024	National Exam at CSUDH
June 2 - 14, 2024	Study Camp
July 22 - 31, 2024	International Chemistry Olympiad

Announcing the 2023 Richard C. Tolman Award Recipient

The 2023 Tolman Award recipient is **Professor Sarah H. Tolbert**, Department of Chemistry and Biochemistry at the University of California, Los Angeles for her research in Nanoscience and Materials Chemistry.

Congratulations, Professor Tolbert!

We will honor Professor Tolbert at the Tolman Award Dinner. Look for more information in our next issue.



Sarah H. Tolbert is a Distinguished Professor in the Departments of Chemistry and Biochemistry and Materials Science and Engineering at UCLA. Her research focuses on controlling nanometer-scale architecture in solution-processed nanomaterials to generate unique optical, electronic, magnetic, structural, and electrochemical properties. She has published over 200 scholarly research articles and has 20 patents focusing on electrochemical energy storage, organic electronics, nanomagnetism, nanoscale control of thermal conductivity, and new ultra-hard materials. She also serves as the faculty direct for a program aimed at bringing nano-concepts to schools, students, and the general public throughout the greater Los Angeles area.

Professor Tolbert is the recipient of a number of awards including the American Chemical Society Henry H. Storch Award in Energy Chemistry, Fellow of the Royal Society of Chemistry, an NSF Special Creativity Award, the ACS R.A. Glen Award, and the UCLA Diversity, Equity, and Inclusion Award. She currently directs the Center for Strain Optimization for Renewable Energy (STORE) which is a part of the DOE Science Foundations for Energy Earthshots program.

(Continued on page 8)

SCALACS 50/60/70-YEAR MEMBERS AS OF JAN. 2024

We would like to congratulate our senior members on their tenure and thank them for their long-term support of the American Chemical Society:

50 Year

Mr. Charles Timothy Angelis
Mr. William S. Bartlett
Dr. Helen M. Berman
Dr. Michael Bruce Bolger
Dr. Larry R. Dalton
Dr. Jagjit Raj Kumar Dhawan
Dr. Dennis A. Dougherty
Dr. Robert William Gellert
Mr. Curtis Allen Marcott
Mr. William C. Ross
Ms. Maria Erlinda Co Sarno
Dr. David Anthony Tirrell

60 Year

Ms. Donna M. Bryan
Dr. Juh Wah Chen
Dr. Herbert W. Fulmer
Dr. Robert E. Hollins
Professor Kendall N. Houk
Dr. Hung Hee Lee
Mr. Robert James Monahan
Dr. Edith Shen Wei Wang

70 Year

Dr. Arthur K. Cho
Dr. Paul E. Greene
Dr. Edwin T. Harper
Dr. Ray R. Irani
Mr. Frank S. La Viola
Dr. Ken Nobe

We want to remind our older members that we have a spot on our website for Reminiscences by our Senior Members. If you have an anecdote, story or remembrance of your career as a chemist that you would like to share, please email to SCALACS office at office@scalacs.org



Celebrating Women in Chemistry: Los Angeles County Women in STEM: 2022

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

In the March SCALACS magazine, we noted that women's contributions to chemistry and other STEM fields have been largely overlooked in the past, due in part to the fact that fewer women than men engage in STEM employment. In this article we explore the employment and earnings of women residing in Los Angeles County who work full-time in STEM fields.

Employment of Los Angeles County Women in STEM Occupations

In 2022, there were close to 1.5 million Los Angeles County women employed full time. Over half (51%) of these full-time working women held jobs in management, business, science, and arts; this cluster of occupations includes the relatively small number of women holding jobs in STEM fields. In 2022, just over 47,000 (3%) of L.A. County women

who worked full-time had jobs in STEM areas:

- 8,400 were life or physical scientists
- 22,700 worked in computer occupations
- 10,000 were engineers
- 6,300 were mathematicians

In 2022, women comprised 42% of the County's full-time employed labor force; but only one in four (25%) of the full-time work force employed in STEM fields was a woman. (These figures for Los Angeles County are the same for California as a whole.)

The overall percentage of women relative to men in STEM jobs has not changed significantly from 2012, although the distribution has shifted slightly. By 2022, the proportion of women in computer and mathematical jobs had decreased, while the percentage of women in the life and physical sciences had increased.

**Percentage of Los Angeles County Full-Time Working Women
Relative to Men in STEM Fields**

	2012	2022
[S] Life/physical scientists	45%	47%
[T] Computer occupations	25%	22%
[E] Engineers	16%	17%
[M] Mathematicians	53%	49%
Women in the full-time STEM workforce	24%	25%

In 2012, women were underrepresented in most STEM areas and vastly underrepresented among engineers (16%) and those in computing jobs (25%). In 2022, the situation has not improved: the proportion of women engineers has remained about constant while the proportion of women

holding computer jobs has decreased. At the level of disaggregation published by the American Community Survey of the U.S. Census Bureau, the specific status of women chemists isn't available; but nearly half (47%) of life scientists and physical scientists are women.

(Continued on page 5)

(Continued from page 4)

Earnings of Los Angeles County Women in STEM Fields

The median earnings for all Los Angeles County women working full time in 2022 was \$54,660, with a wide range of earnings which depend on the type of occupation. Jobs in STEM fields are among the highest

paying jobs held by women in the County. The median earnings for women working full time in computer, engineering and science was \$90,873; of this grouping, architect and engineers had the highest median earnings of just over \$100,000.

Median Earnings of Los Angeles County Women Working Full Time: 2022

	All Occupations	STEM Occupations	Computer and Mathematical Occupations	Architects and Engineers	Life, Physical and Social Scientists*
Women	\$54,660	\$90,873	\$90,487	\$101,785	\$80,595
Percent Women's Earnings / Men's	91%	88%	87%	96%	98%

**Note: Social scientists are included in Los Angeles County earnings figures, but not employment figures. For reference, women comprise just under half of life and physical scientists in the county but about 70% of social scientists. With the inclusion of social scientists, the median earnings of women are about equal to that of men.*

When comparing earnings of women to those of men within any group of occupations, women nearly always earn less than men. Among all full-time workers who reside in Los Angeles County, women earned 91% of what men earned in 2022. In STEM fields, where median earnings of women tend to be higher than for women in other occupations, women earned only 88% of what men earned.

- Women in STEM fields (including the social sciences) have higher median earnings than full-time working women overall: \$90,873 and \$54,660, respectively. (Table 2)
- Women in STEM fields have median earnings that are less than men; women working in computers, engineering and science earned 88% of what men earned in 2022. (Table 2)

Three Takeaways for Los Angeles County Women Working Full Time in STEM Occupations

- Women remain underrepresented in STEM fields and are vastly underrepresented in engineering and computer occupations, where roughly 1 in 5 full-time workers is a woman. (Table 1)

Data at the level of analysis cited in this article do not pinpoint specific reasons for either the underrepresentation of women in STEM occupations or for the gender earnings gap.

Editor's Note:

The statistics in this article are taken from the U.S. Census Bureau. 2022 American Community Survey 1-Year Estimates. (Selected for Los Angeles County full-time workers.) Each statistic is reported by the Census Bureau with a margin of error, based on the modeling of sample results to represent the population as a whole. Margins of error can be found in the Census data tables (<http://data.census.gov>).

BY

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Recent editions of this column have explored the copyright doctrine of fair use and the 1976 “Agreement on Guidelines For Classroom Copying In Not-For-Profit Educational Institutions,” which articulate minimum, non-binding standards of permissible copying in the educational setting. Readers might wonder: Do the standards of permissible copying differ for people when they themselves authored the material they are copying?

The answer is “maybe,” but not because the doctrine of fair use changes. One circumstance in which the standard of permissible copying changes is when the author owns the copyright. An author who owns the copyright to a work can obviously copy the work as much as desired. The author cannot infringe his or her own copyright.

But as many readers know from experience, most publishers require an author to transfer to the publisher the copyright in the work to be published. So, for example, the author of a journal article will often be required to sign a copyright transfer agreement conveying his or her copyright in the article to the journal publisher. Often, per the particular copyright transfer agreement, the author will retain certain rights in the work.

For example, as of this writing, ACS reports on its website (https://pubs.acs.org/page/copyright/learning_module/module.html) that

the ACS Journal Publishing Agreement lists as permitted uses: use in theses and collections of your own work, teaching and training, presentations at conferences and seminars, sharing with colleagues, posting on websites and repositories, sharing links to eprints of the published work, use and authorizing the use of supporting information, and other permitted uses by authors that are delineated in the agreement.

The ACS website also states that you may deposit a digital file of the submitted version of your ACS papers publicly on websites as long as it is for non-commercial purposes, does not violate the ACS Ethical Guidelines, and you have written confirmation from the appropriate ACS journal editor that the posting does not conflict with their prior publication policies. The ACS website also states that you may reproduce the Submitted, Accepted, or Published versions of your ACS papers as stand-alone handouts, as part of a packet, or electronically in courses you are teaching. Electronic access must be password protected only to enrolled students. Proper credit and the ACS Articles on Request links must be used for Published versions. Additionally, the website states that you may reuse figures, tables, artwork, illustrations, and text extracts of up to 400 words, and data from your ACS papers for teaching or training purposes.

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.

BY

HAROLD GOLDWHITE
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I continue to look back at the new chemistry of 90 years ago as reflected in the pages of The Chemical Society's Annual report for 1934 (Volume XXXI) published in London in 1935.

Work by Hieber, Manchot and others has led to a considerable increase in understanding of metal carbonyls, nitrosyls, and related compounds. Five monometallic carbonyls of the transition elements are known. The first, discovered by Mond, is nickel tetracarbonyl, $\text{Ni}(\text{CO})_4$. The others are chromium, molybdenum, and tungsten hexacarbonyls, and iron pentacarbonyl. Langmuir in the 1920s pointed out that in these volatile carbonyls it appears that each CO contributes 2 electrons to the central metal atom allowing it to reach the number of electrons in the next noble gas. Consequently, monometallic carbonyls are not formed by elements of odd atomic number; cobalt "tetracarbonyl" is actually a dimer, $\text{Co}_2(\text{CO})_8$. Sidgwick has published a book "The Covalent Link" summarizing his and co-workers theoretical work on these compounds. They conclude that the co-ordination of carbon monoxide is through the binding of the carbon atom to the metal. This is supported by measurements of dipole moments; interatomic distances; heats of formation; force constants, and the parachor.

Stock has published a book summarizing his Baker lectures at Cornell University on the hydrides of boron and silicon. This includes some 80 papers by Stock, his collaborators, and others. The boranes isolated from reaction between magnesium boride and phosphoric acid belong to two series: the more stable B_nH_{n+4} including diborane, $n = 2$; and the less stable hydroboranes, B_nH_{n+6} . I now quote from the reporter: "The structure of B_2H_6 is a perpetual puzzle, and

in spite of the great ingenuity displayed by numerous writers, it appears that no completely satisfactory solution has yet been reached. " The uv absorption spectrum of diborane resembles that of ethylene rather than that of ethane; and that of B_4H_{10} has similarities to that of butadiene! When the ammonia addition compound of diborane is heated to 200°C for several hours the very stable $\text{B}_3\text{N}_3\text{H}_6$ (borazine). Is obtained. This appears to be an inorganic analog of benzene with alternating boron and nitrogen atoms in the ring.

Two types of natural diamond have been discovered that differ in some of their physical properties. A laminar type is transparent in the uv up to 2250 \AA ; the ordinary diamond is opaque in the uv below 3000 \AA . There are also differences in electrical conductivity. X-ray diffraction studies indicate that the newly discovered laminar diamonds have a mosaic structure and are more optically isotropic than ordinary diamond. Density, refractive index, dielectric constant, and Raman effect are identical for both types. The investigators believe that the differences are not due to trace impurities.

Reactions between sulfur and chlorine, studied by Lowry and his collaborators during recent years, have produced a series of compounds whose structures are slowly being elucidated, "Sulfur monochloride" S_2Cl_2 is probably a mixture of two forms: ClSSCl and SSCl_2 . Sulfur tetrachloride, SCl_4 , seems to be polar and may best be formulated as $(\text{SCl}_3)^+\text{Cl}^-$. A new chloride S_3Cl_4 has been isolated. Its structure is believed to be $[(\text{ClS})_2\text{SCl}]^+\text{Cl}^-$.

If you are waiting for some long overdue insights into new organic chemistry in 1934, please be patient. I promise you that in my next installment.

GET A

CHARGE

April 21-27, 2024 | #CCEW

OUT OF CHEMISTRY



This year CCEW's theme is "Get a Charge out of Chemistry." We are celebrating batteries and their role in creating a more sustainable world. Batteries have the power because they can accept energy from alternative energy sources such as solar, wind, and hydropower, then store it in chemical bonds. Anywhere and anytime we want, batteries release electrical energy. Today, batteries are an indispensable part of our world. We use them in devices, such as remote controls, wheelchairs, hearing aids, cars, mobile phones, laptops, bike lights, and more.

Did you know that by 2025, the global EV (electric vehicle) market is expected to be valued at \$567 billion? Innovations in battery design and efficiency for the entire lifecycle of batteries will protect our environment even more. Get a Charge out of Chemistry as you learn about batteries and their impact on our everyday lives!

SCALACS will be hosting events during the CCEW. Join us on Apr. 25 for a **CCEW Virtual Seminar** presented by our 2023 Tolman Award recipient, **Prof. Sarah Tolbert**, titled "Holey Batteries Batman, Can Chemists Really Help Solve Our Energy Problems?" This is a free event open to everyone. See the registration information on Page 9.

(Continued from page 3)

Research in the Tolbert group focuses on the intertwined goals of:

- (1) using solution-phase methods to producing new nanostructured materials, and
- (2) using materials structure and architecture to control physical properties in a broad range of systems.

Within this framework, Tolbert group research can be divided into five topical areas. The first is the development new materials for high rate and high capacity electrochemical energy storage. Here she specifically uses nanoporous architectures to reduce solids state diffusion distance in fast charging electrode materials, and to add mechanical flexibility to high capacity/large volume change electrode materials. Her second research area focuses on controlling the properties of conjugated organic molecules, specifically doped semiconducting polymers. The goal of this effort is to use structural control in polymer assemblies to prevent carrier trapping and increase electronic conductivity. Her work on creating and controlling nanostructured magnetoelectric composites focuses primarily on multiferroic materials, in which an electric potential can be used to modify the magnetic state of a system. Nanoporous magnets provide tunable mechanical flexibility, and magnetic nanocrystals provide soft magnetic building blocks. In her work on synthesizing and interrogating new ultra-hard materials, she uses a combination of solid state and high temperature solution phase methods to create new super-hard transition metal borides in both bulk and nanostructured materials. This family of materials represent some of the hardest know materials that can be synthesized at ambient pressure, and high-pressure radial diffraction studies help her to understand the origins of their impressive mechanical properties. Finally, Prof. Tolbert is developing new routes to porous oxide materials that can be used to improve building efficiency. Specific projects focus on optically clear porous materials for window insulation, and on materials for passive daytime radiative cooling.

All projects combine an intimate mix of materials synthesis, materials characterization, device physics, and fundamental physical understanding, allowing her to work to span many fields of Chemistry.

City of STEM + Los Angeles Maker Faire

SATURDAY, APRIL 6 • 9 AM TO 6 PM
LOS ANGELES STATE HISTORIC PARK

SCALACS will be one of the exhibitors at the City of STEM on April 6, 2024, from 9 am to 6 pm at Los Angeles State Historic Park. This is southern California's largest celebration of science. SCALACS will be there promoting Chemistry with both hands-on activity and handing out Celebrating Chemistry magazines! If you are interested in helping out at the table contact **Veronica Jaramillo** (vjaramillo@pasadena.edu).



In conjunction with Chemists Celebrate Earth Week celebration, join SCALACS for a virtual seminar made possible by the Science Cafe grant from Local Section Activities Committee of ACS.

Title: Holey Batteries Batman, Can Chemists Really Help Solve Our Energy Problems?

Presented by: **Prof. Sarah Tolbert, UCLA**

Date & Time: **Thursday, April 25 • 4 - 5 PM**

This is a free webinar, but please register at: scalacs.org

In this talk, we will

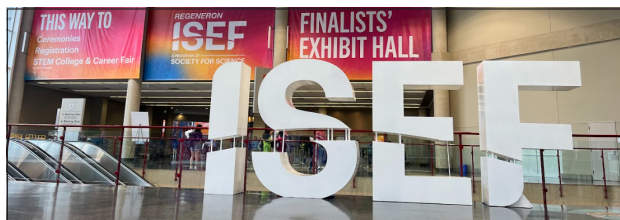
- explore how materials chemistry can help address challenges in improving our energy security and efficiency.
- explore how these 'holey' materials can help solve problems ranging from grid level energy storage for renewable energy to fast charging batteries for vehicle electrification to building efficiency.
- we will consider how porous materials can be used as insulation to improve building efficiency.



REGISTER NOW at www.scalacs.org



CSEF 2024 judging will take place on Tuesday, April 16, 2024, and will be entirely online. More info will be announced at <https://csef.usc.edu/>



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/>

28TH ANNUAL GREEN CHEMISTRY & ENGINEERING CONFERENCE June 3-5, 2024 // Atlanta, GA

« AI-Enabled Green Chemistry »

Dr. Edye Udell, SCALAC's immediate past president 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/>

Baltimore
in
'24

ICGS Conference

June 24-26, 2024

Renaissance Baltimore Harborplace Hotel
Baltimore, Maryland, USA

**SOUTHERN CALIFORNIA SECTION
AMERICAN CHEMICAL SOCIETY**

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Do Not Delay!**

Contains Dated Meeting Announcement

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OUT OF CHEMISTRY

April 21-27, 2024 | #CCEW

www.acs.org/ccew



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- 3-5** ACS Green Chemistry Institute's
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Schools Conference in Baltimore, MD
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Youtube: <https://www.youtube.com/@southerncaliforniasectiona1513>

Twitter: <https://twitter.com/SCALACS1>

For more information or to find events, please see our website: www.scalacs.org