

SILICON VALLEY CHEMIST

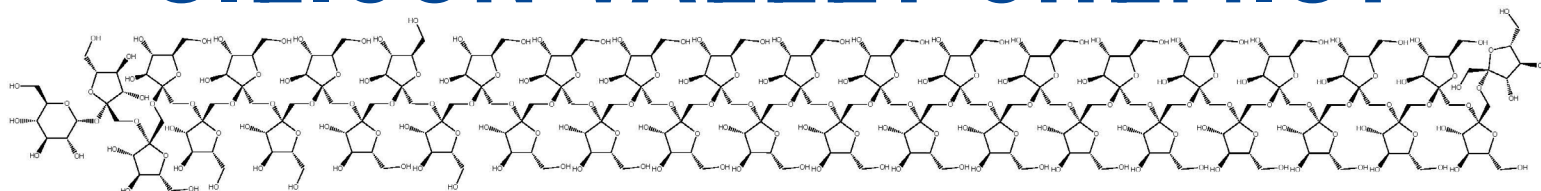
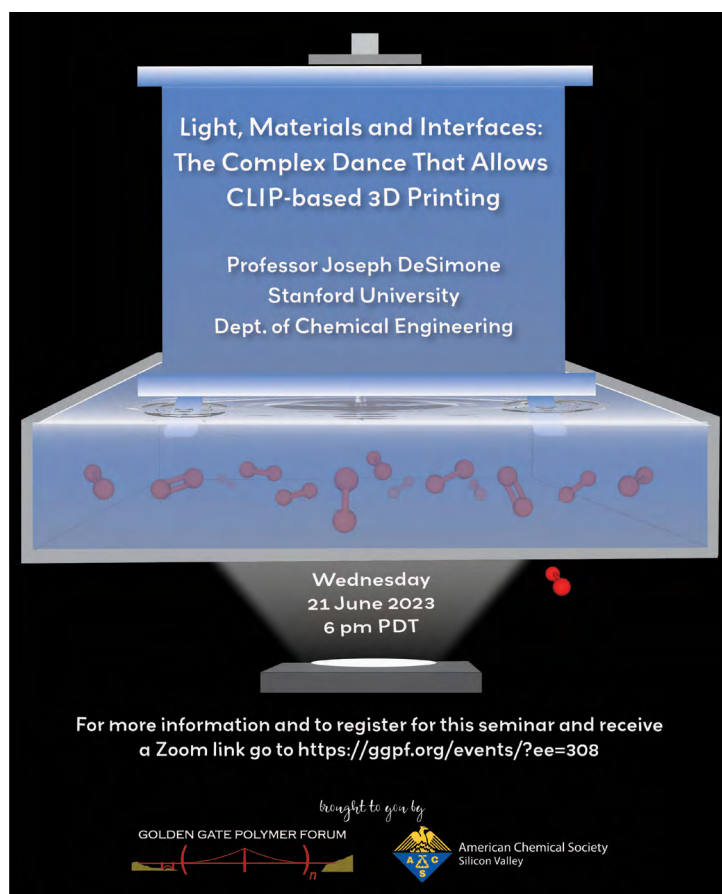


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Light, Materials and Interfaces:
The Complex Dance That Allows
CLIP-based 3D Printing

Professor Joseph DeSimone
Stanford University
Dept. of Chemical Engineering

Wednesday
21 June 2023
6 pm PDT

For more information and to register for this seminar and receive
a Zoom link go to <https://ggpf.org/events/?ee=308>

brought to you by
GOLDEN GATE POLYMER FORUM
American Chemical Society
Silicon Valley

Download and share the colorful flyer

SVACS-GGPF Annual Joint Event

Light, Materials and Interfaces: The Complex Dance That Allows CHIP-based 3D Printing

Professor Joseph DeSimone, Chemical Engineering, Stanford University

Abstract

Continuous Liquid Interface Production (CLIP) provides an alternate means of creating 3D objects from polymers. Digital programming and additive manufacturing combine to produce commercial quality parts rapidly and at scale. CLIP uses oxygen-inhibited photopolymerization to generate a continual liquid interface of uncured resin between a forming part and a printer's exposure window. This allows parts to 'grow' from a pool of resin, formed by light. The

principle has been demonstrated at *Carbon* in Redwood City (formerly Carbon3D) on large-scale production of running shoes (Adidas, Futurecraft 4D), customized football helmets (Riddell), dentures, and numerous parts for the automotive, consumer electronics, and medicinal markets. Academic *research* continues at Stanford in multi-material printing, recyclables, therapeutic devices in pediatric medicine, and in the design of higher resolution printing microelectronics and drug/vaccine delivery.

continued on next page

Bio

Professor DeSimone's role at Stanford University spans multiple departments including Chemical Engineering, Radiology, Materials Science and Business. Previously, he was in the Chemistry Department at the University of North Carolina at Chapel Hill and the Chemical Engineering Department at North Carolina State University. He was also the co-founder, Board Chair, and CEO of the additive manufacturing company, **Carbon** (formerly Carbon3D).



DeSimone has published over 350 scientific articles and is on over 200 issued patents. In addition to 3D printing, his previous research included environmentally friendly manufacturing processes for the synthesis of fluoropolymer materials and imprint lithography-based nanoparticle manufacturing. In addition to Carbon3D, DeSimone co-founded **Liquidia Technologies** to produce uniform nanoparticles for medicine with independent control over particle parameters such as size, shape, composition, modulus, and surface chemistry.

DeSimone received his B.S. in Chemistry from Ursinus College in Collegeville, PA (1986) and his Ph.D. in Chemistry from Virginia Tech (1990). He has received numerous recognitions for achievements in science, engineering, invention, and business, including a National Medal of Technology and Innovation from President Obama in 2016.

Chair's Message

Natalie McClure



As those of you who read our newsletter know, the Silicon Valley section is very active. We organize evening seminars, awards, public outreach, student support, and more. I am thrilled to report that this year our section has been selected as a finalist for the ACS Outstanding Section of the Year Chemluminary

Award. The size of our section – approximately 2,300 members – puts us in the category of 'large' local sections. As background - SVACS is one of 189 local ACS sections across the nation that comprise nearly 160,000 members total. We will be in competition with several other large ACS local sections for the Chemluminary Outstanding Large Local Section Award to be recognized for a high level and quality of section activities. The winners of the various ChemLuminary awards are recognized each year at the Fall annual meeting in a ChemLuminary award ceremony that is open to all meeting attendees. Since the next Fall meeting is in San Francisco, you are all invited to attend, see what the different sections have been doing, and cheer on our section for the Outstanding Section Award. Mark your calendars for Tuesday evening, August 15, in Salon 8-9 at the San Francisco Marriott Marquis (780 Mission Street). The ceremony will feature a keynote address by Mamie Moy, University of Houston, recipient of the 2023 Award for Volunteer Service to the American Chemical Society. The presentations of awards given by 21 committees of the Society for a wide range of activities will follow. The theme

of this year's event is "Harnessing the Power of Our Volunteers" and celebrates the work of volunteers to improve all people's lives through the power of chemistry.

With the Fall ACS national meeting being in SF in August, our local section has the distinction of being a local host at the meeting.

Join us to help staff the Local Section booth and greet attendees from around the world.

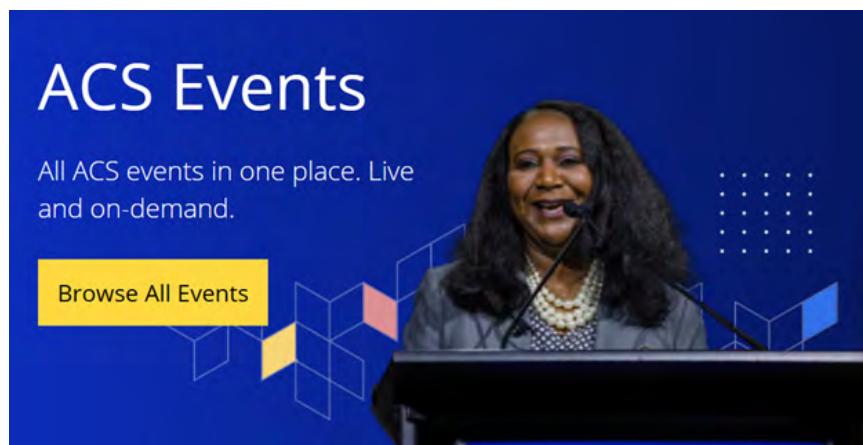
I am also pleased to report that a student from our section, Raenne Li, won second place in the 6-8th grade category of the national **2023 Chemists Celebrate Earth Week (CCEW) Illustrated Poem Contest** with the theme, "The Curious Chemistry of Amazing Algae." Her **winning poem** and art entry is featured on the **CCEW** website and on page 3 of this SVACS newsletter. Raenne Li is a 7th grade student at Harker School and her teacher, Raji Swaminathan, is an active supporter of this program and one of our great teachers for Science.

Continuing our celebration of the exemplary students in our section, I am pleased to report that 2 of the students from our section's area who took the National exam for the **Chemistry Olympiad** received High Honors which means that they placed in the top 50 students nationwide. An additional 5 students from our region were awarded Honors, by placing in the top 150 students. Next time you are talking with a local high school chemistry teacher, be sure to compliment them on the excellent job they are doing for our community.

On June 21 we will continue our annual tradition of jointly hosting a program with the **Golden Gate Polymer Forum**. The speaker is Prof. Joseph DiSimone, from Stanford University, whose talk is on "Light, Materials and Interfaces: The Complex Dance That Allows CLIP-based 3D Printing." DeSimone is well-known for a Bay area company he co-founded with a novel approach to 3D printing, Carbon. Read more about the June 21 webinar in this newsletter.

We look forward to our **annual summer picnic** on July 8 at Cuesta Park in Mountain View with BBQ, wine- and beer-tasting. I hope you can join us there as a highlight is recognizing winners of the SVACS Ottenberg Award, the SVACS Community College Teacher Scholar Awards, and the honored participation of our 50-, 60- and 70-year ACS members.

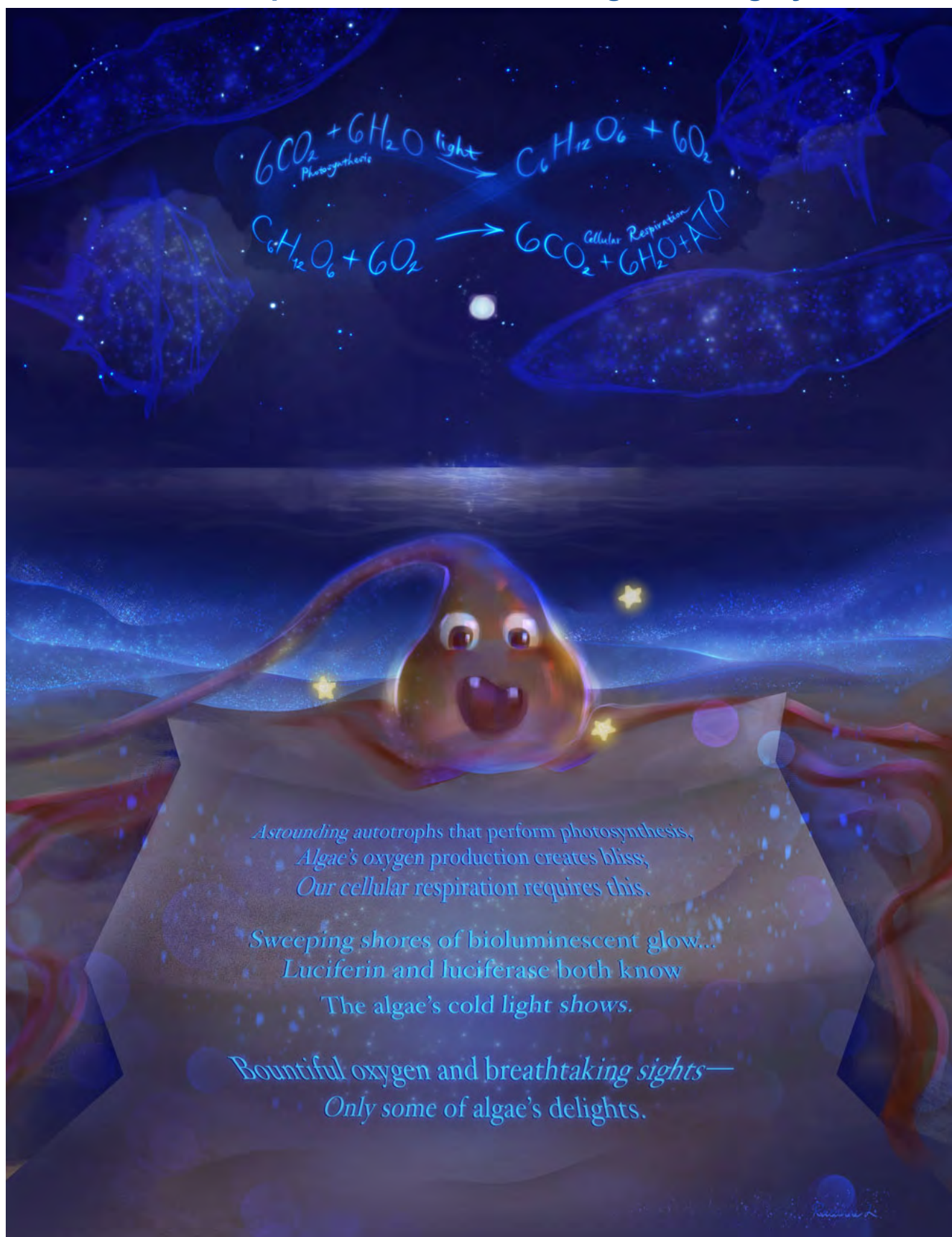
NEW – All ACS Events Listed in One Place!



Visit the ACS Events web page.



Chemists Celebrate Earth Week ACS National Illustrated Poem Contest
2023 Theme “The Curious Chemistry of Amazing Algae”
Raenne Li, 7th Grade, Harker School
Second place winner in the 6-8th grade category



CALENDAR OF EVENTS

<https://www.siliconvalleyacs.org/events/>

- June 2023 -

- Jun 1** **The Road to Billions of Tonnes of Carbon Sequestration**
Sponsored by ACS Webinars and ACS Engineering Au
11am-Noon, Online via Zoom, Free, [Registration required](#)
- Jun 7** **An Insider/Outsider Journey: Life Reflections with Nobel Laureate Carolyn Bertozzi**
Sponsored by ACS Webinars and ACS Office of Diversity, Equity, Inclusion & Respect
11am-Noon, Online via Zoom, Free, [Registration required](#)
- Jun 8** **Process Chemistry: A Day in the Life**
Sponsored by ACS Webinars and ACS Office of Career and Professional Education
11am-Noon, Online via Zoom, Free, [Registration required](#)
- Jun 8** **Silicon Valley Executive Committee Meeting (In-person and Virtual)**
7:00-8:30pm. Open Meeting, please contact [Chair](#) to attend as a guest.
- Jun 10** **Kid Makers: Pop Up Chemistry (for Middle School Scientists)**
Sponsored by Silicon Valley ACS and Redwood City Public Library
Location: Redwood City Public Library, Downtown Library, 1044 Middlefield Road, Redwood City, Free, [Learn more](#)
- Jun 13-15** **27th Annual Green Chemistry & Engineering Conference**
Long Beach, CA and Virtual, [Register now](#)
- Jun 15** **The CHIPS and Science Act: What's in it for the Chemistry Enterprise?**
Sponsored by ACS Webinars and ACS Advocacy and ACS Government Affairs
11am-Noon, Online via Zoom, Free, [Registration required](#)
- Jun 21** **Light, Materials and Interfaces: The Complex Dance That Allows CLIP-based 3D Printing**
Prof. Joseph DeSimone, Dept. Chemical Engineering, Stanford University
Jointly sponsored by Golden Gate Polymer Forum and Silicon Valley ACS
6-7pm, Online via Zoom, Free/\$5 Donation, [Registration required](#)
(Registration deadline: June 20th at 1pm)

- July 2023 and Beyond -

- Jul 8** **Annual ACS Silicon Valley Picnic and Awards**
4-7pm, Cuesta Park Group BBQ Areas #1-2, Mountain View, CA.
[Learn more](#)
Cost: Adult: \$20.00 | Student: \$10.00 | Children under age 12: \$5.00
(Registration deadline: July 5th)
- Aug 13-17** **ACS Fall 2023 National Meeting (In-Person and Virtual)**
Theme: Harnessing the Power of Data
Moscone Center, San Francisco, CA
[Registration and Housing are now open](#)

Helium Shortage 4.0 - Why We Must Stop Helium Party Balloons



"This is a Girl Scouts Silver Award project, aiming to help make the world a better place by looking at the problems observed in our everyday life. Helium is more important than people often think, and this video hopes to show you why exactly that is, and provide evidence-based facts, whether you already knew some of them or not.

In case there is any question as to the sources, every statement in the following five and a half minutes has been reviewed for accuracy at least two to three times and comes from between one and five different credible sources and websites."

[Watch on YouTube](#)

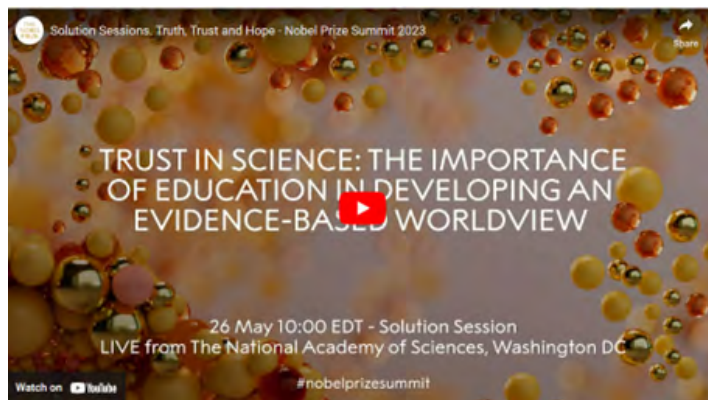
Nobel Prize Summit 2023 Truth, Trust and Hope



"How can we build trust in truth, facts, and scientific evidence so that we can create a hopeful future for all?"

Misinformation is eroding our trust in science and runs the risk of becoming one of the greatest threats to our society today.

Sponsored by the National Academy of Sciences and held on May 24-26, 2023, this year's Nobel Prize Summit brought together laureates, leading experts, and the public in a conversation on how we can combat misinformation, restore trust in science and create a hopeful future."



[Watch on YouTube](#) | [Visit the Nobel Prize Summit website](#)



Silicon Valley ACS Annual Picnic & Awards

Come celebrate together with
wine- & beer-tasting, good food & awards



Saturday, 8 July 2023
4-7 pm
Cuesta Park Group BBQ
Areas #1 & #2, Mountain View



 For information go to 
<https://www.siliconvalleyacs.org/event/annual-picnic-and-awards-ceremony/>
Registration (deadline 5 July 2023) is required to make sure there is plenty of food.

Paving the Path (PtP) Initiative Programming for Community College Students

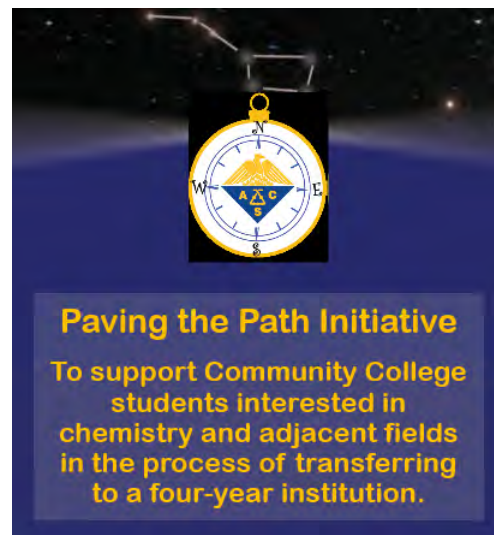
Virtual Career Panel April 27, 2023

by Madalyn Radlauer

Over 50 community college students, alumni, instructors, and supporters from around our section gathered by Zoom on April 27th for a Virtual Career Panel that showcased four scientists who started their higher education journeys at community colleges: industry professional Joel Bruegger, Associate Professor Kelly Chacón, Assistant Professor Andro Rios, and PhD student Victoria Tafuri. For the next two hours, the four shared their stories and advice in a series of interactions that included a moderated panel, an open Q&A session, and small groups in breakout rooms.

Two special features of this event: (1) an in-person watch party at Hartnell College where students gathered for SVACS-supplied pizza to participate in the Zoomed career panel as a group

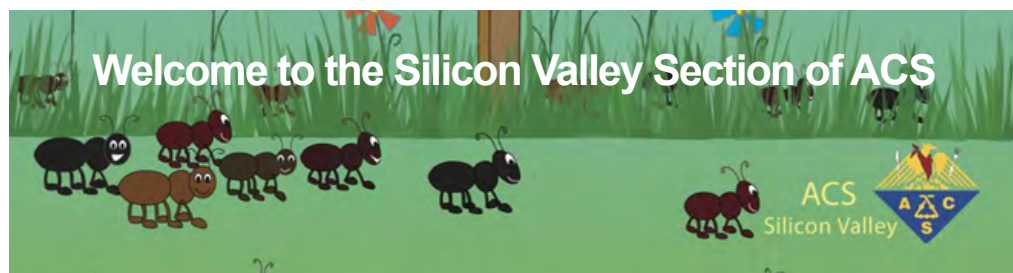
and (2) a raffle for ACS prizes among those who filled out a post-panel survey. Survey respondents unanimously said they would recommend the event to other people in the same stage of their education. Feedback included “This panel was very helpful and inspirational for a community



college student like me” and “we gained wisdom from the panelists and a better idea of possible career paths.”

SVACS plans to run this Virtual Career Panel event annually and is looking for community college alumni interested in serving as panelists. Interested in organizing a watch party? **Contact us** as an administrator, faculty, staff member or student at a community college and we'll reach out when a date is set.

Keep an eye out for announcements about our future PtP events via the SVACS newsletter, website, and social media. If you're interested in getting more involved with the PtP Initiative or have an idea for an event, contact the PtP chair, Madalyn Radlauer (madalyn.radlauer@sjsu.edu).



Each month, the section receives a spreadsheet from national ACS with the names of members new to our section. The members are either new to ACS, have transferred in from other areas, or are the newest members - students. As a welcoming gesture, the SVACS Executive Committee offers new members free registration at a catered SVACS event. Come join us at our annual summer picnic on Saturday, July 8th in Mountain View. More details in the colorful picnic flyer in this newsletter. To register as our guest for an in-person dinner event, **contact us** directly to receive complimentary admission for you and a friend.

We hope you will also join us for an outreach event, like judging a science fair, proctoring the high school Chemistry Olympiad or participating in a National Chemistry Week hands-on experiment event. The local section is a volunteer organization. Attend an event, volunteer to help, and get to know your local fellow chemists. Welcome!

NEW ACS MEMBERS

Nancy Newton Becker
Timon Becker
Casey Cazanjan
Xuejing Chen
Ting-Rong Chern
Christopher A. Crain
Ali Dashti
Narelli de Paiva Narciso
Steve Eglash
Zachary Epperson
Alison Fritz

Leslie Funk
Dashiel Szeleny Grusky
David John Hoffman
Fangying Jin
Yankang Jing
Alejandra Kristina Johnson
Yukiko Kawahara
Jason Matthew Kronenfeld
Shanmukh Kutagulla
Xiaoyan Li
Yiran Liang

Morgan Edward Crowther
Miller
Jose G. Napolitano
David Matthew Peacock
Sarah Robinson
Melanie Segura Guerrero
Mojgan Solouki
Maurice Nguyen Standlee
Claire Stewart
Katherine Tu
Jiaxin Zhang

What Is Meat? (video)



[Watch on YouTube](#)

“Beyond “burgers.” Impossible “meat.” A huge meatball (supposedly) made from wooly mammoth DNA. Chemistry is changing how we think about meat, and as technology advances, things are only going to get more confusing.

Reactions is a video series produced by the American Chemical Society and PBS Digital Studios. Subscribe to *Reactions* at <http://bit.ly/ACSReactions> and follow us on Twitter @[ACSReactions](#).

Outstanding Chemistry Teachers at California Community Colleges Win SVACS Awards

The California Community College system is the largest system of higher education in the country, serving 1.8 million students. To recognize the invaluable contributions of community college faculty, the Silicon Valley ACS initiated the *Teacher-Scholar Award* in 2008.

The SVACS Teacher-Scholar Award honors community college faculty who demonstrate excellence in teaching, mentoring and scholarship and/or who make impactful contributions to their communities through outstanding leadership and service. This year SVACS is conferring in-person two Teacher-Scholar Awards: one for 2022-2023 academic year and one for the 2021-2022 (pandemic-era) academic year.

We are pleased to announce these award winners selected from chemistry departments across the 116 California Community Colleges.



[Watch video](#)
[About GCC Organic Chemistry Research](#)

2021-22 Teacher-Scholar Award Winner: **Rushia Turner**



Rushia Turner is a full-time *chemistry instructor* at *Monterey Peninsula College* (MPC). A “dynamic force” at MPC, Rushia has been instrumental in improving access for historically underserved students to research internships and educational programs outside the classroom. She is an outstanding instructor, a strong advocate for inclusive learning and teaching, and a devoted mentor to her students, providing them with guidance, encouragement and assistance as they navigate toward their chosen careers.

Please join us for the presentation of these awards at the *annual Silicon Valley ACS summer picnic* on July 8, 2023 in Mountain View. This lively SVACS tradition is family-friendly, so bring your friends and family to enjoy barbecue, wine- and beer-tasting, and good company.

2022-23 Teacher-Scholar Award Winner: **Asmik Oganessian**



Asmik Oganessian is a full-time *chemistry instructor* at *Glendale Community College* (GCC). In her 15 years at GCC, Asmik continually seeks innovative approaches to her teaching by adopting new pedagogical approaches and developing curriculum. She has developed a unique undergraduate research program for organic chemistry students at GCC and has successfully secured grant funding to support it with instrumentation and equipment. Asmik’s enthusiasm, creativity and hard work are inspirational to her students and colleagues alike.

Geographic Distribution of Nonprofit R&D Performance in FY 2020

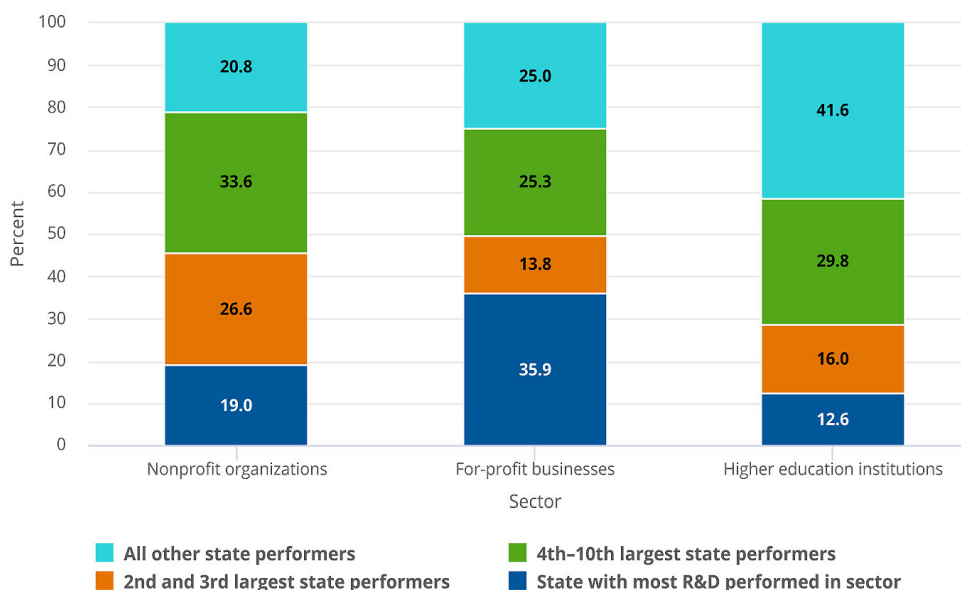
“Data show that nonprofit R&D was more geographically concentrated than the R&D of for-profit businesses and higher education institutions in 2020. Roughly 80% of U.S. nonprofit organizations’ estimated R&D performance in FY 2020 was concentrated in just nine states and the District of Columbia, with nonprofit organizations performing more R&D in Massachusetts than any other state.”

[Read the analysis](#) | [View data tables](#)

Published by the National Science Foundation’s National Center for Science and Engineering Statistics on May 9, 2023.

National Center for Science and Engineering Statistics | NSF 23-329

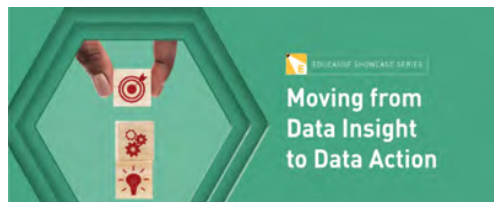
Figure 1
State concentration of R&D performance, by sector: 2020



Spotlight on EDUCAUSE

“EDUCAUSE is a nonprofit association and the largest community of technology, academic, industry, and campus leaders advancing higher education through the use of IT. ... We welcome diversity—in viewpoints and experience—and believe in the transformative power of uncommon thinking for the common good.”

Below are selected resources from the **EDUCAUSE** website. Hopefully, this information is useful and will spark your curiosity to explore the website.



“Data is as indispensable as technology to the activities of a college or university. Today’s data professionals are navigating the data journey from “what” to “so what” to “now what” by using insights, planning ahead, and taking action.” [Learn more](#)

Horizon Reports

“The **EDUCAUSE Horizon Report**[®] profiles key trends and emerging technologies and practices shaping the future of higher education and envisions a number of scenarios and implications for that future. It is based on the perspectives and expertise of a global panel of leaders from across the higher education landscape.” Below are reports published so far in 2023.



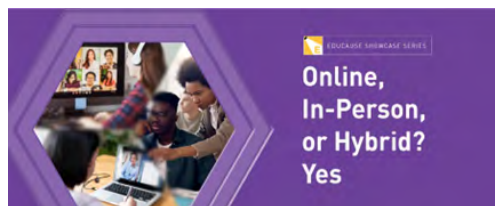
“This report profiles key trends and emerging technologies and practices shaping the future of teaching and learning and envisions a number of scenarios and implications for that future. It is based on the perspectives and expertise of a global panel of leaders from across the higher education landscape.” [Learn more and read full report](#)



“Data processes play a foundational role in just about every professional discipline, and data stakeholders all over the world are grappling with modernizing and optimizing data governance policies and practices. In this rapidly evolving landscape, what challenges will higher education face, and how will we rise to meet those challenges? How can we leverage our individual and collective expertise to create innovative and durable data governance solutions?”

Approaching these questions with a spirit of hope and optimism, a panel of higher education data and analytics experts from a range of institution types assembled to describe an optimized future of data governance, focusing on a 10-year timescale. Building on the trends, technologies, and practices described in the **2022 Horizon Report: Data and Analytics Edition**, the panel crafted its vision of the future along with practical action items the data and analytics community can employ to make this future data management planning a reality.” [Learn more and read full report](#)

From the 2023 Showcase Series



“The opportunities and needs for technology-enabled learning in higher education have changed drastically over the past three years, as have students’ learning preferences. Done well, a learning-first and multimodal strategy can make possible new, more flexible, and more relevant learning opportunities to attract an increasingly diverse student population.” [Learn more](#)

Open Educational Resources (OER)

Explore this resource site—a collection of all EDUCAUSE resources related to open educational resources (OER) in higher education. [Web Sites with OER resources](#) on this page along with their descriptions have been reprinted below:

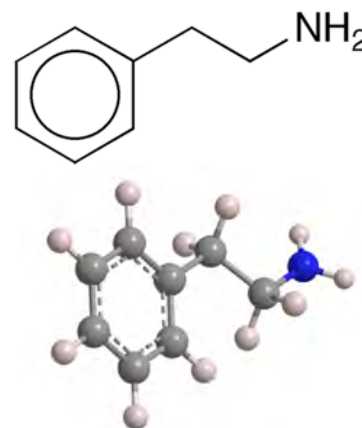
- **The Community College Consortium for Open Educational Resources - CCCOER** is a joint effort by the OER Center for California, Foothill-De Anza Community College District, the League for Innovation in the Community College and many other community colleges and university partners to develop and use open educational resources (OER) and especially open textbooks in community college courses.
- **OpenStax** is a non-profit digital ecosystem serving millions of users per month in the delivery of free educational content to improve learning outcomes.

- **Free Online Course Materials** is a California State University MERLOT collection of over 35,000 open course materials.
- **MIT OpenCourseWare (OCW)** is a web-based publication of virtually all MIT course content. OCW is open and available to the world and is a permanent MIT activity.
- **The Open Course Library**, from Washington State University, is a collection of expertly developed educational materials – including textbooks, syllabi, course activities, readings, and assessments – for 81 high-enrollment college courses. 42 courses have been completed so far, providing faculty with a high-quality, affordable option that will cost students no more than \$30 for textbooks.
- **OER Commons** was created as a network for teaching and learning materials, the web site offers engagement with resources in the form of social bookmarking, tagging, rating, and reviewing.
- **WikiEducator** is a community project working collaboratively with the Free Culture Movement towards a free version of the education curriculum by 2015. Driven by the learning for development agenda WikiEducator is developing free content for use in schools, polytechnics, universities, vocational education institutions and informal education settings.
- **The World Digital Library (WDL)** makes available on the Internet, free of charge and in multilingual format, significant primary materials from countries and cultures around the world.

CHEMISTRY

Quiz

I’m the basic structure of a large family of psychoactives. What molecule am I?



Answer

CAMEO Chemicals Database

Computer Aided Management of Emergency Operations

Developed jointly by the U.S. National Oceanic and Atmospheric Administration (NOAA) and the U.S. Environmental Protection Agency (EPA), **CAMEO Chemicals** is a hazardous chemical database that is used widely to plan for and respond to chemical emergencies. With CAMEO Chemicals, you can search through the extensive chemical database to find chemical datasheets with critical response information, including physical properties, health hazards, information about air and water hazards, and recommendations for firefighting, first aid, and spill response. CAMEO Chemicals also has a tool to predict possible hazards if chemicals are

mixed together. Learn more about the content and search options: [CAMEO Chemicals Help Topics](#).

CAMEO Chemicals is available for free as a website, mobile website, mobile app, and desktop program ([access/download](#)). All the formats use the same database, so the content is the same but features available vary. The mobile app and desktop program formats can be used offline, so that you don't have to rely on an internet connection to get your response information. CAMEO Chemicals is part of the **CAMEO® software suite**. The desktop version of CAMEO Chemicals can share information with other CAMEO suite programs. See [CAMEO Chemicals Fact Sheet](#) and [CAMEO Chemicals Feature Comparison Chart](#).

Chemical Datasheet

Add to MyChemicals

Print Friendly Page

CHLORINE



[Chemical Identifiers](#) | [Hazards](#) | [Response Recommendations](#) | [Physical Properties](#) | [Regulatory Information](#) | [Alternate Chemical Names](#)

Chemical Identifiers

[What is this information?](#)

CAS Number 7782-50-5 **UN/NA Number** 1017 **DOT Hazard Label** Poison Gas Oxidizer Corrosive **USCG CHRIS Code** CLX

NIOSH Pocket Guide [Chlorine](#) **International Chem Safety Card** [CHLORINE](#)

NFPA 704

Diamond	Hazard	Value	Description
	Health	4	Can be lethal.
	Flammability	0	Will not burn under typical fire conditions.
	Instability	0	Normally stable, even under fire conditions.

Compatibility Chart

This chart provides an overview of the reactivity predictions. For more details, click on a cell or scroll down the page.

[How do I read this chart?](#)

	CHLORINE		
ACETONE	Incompatible ■ Corrosive Explosive Flammable Generates gas Generates heat Intense or explosive reaction Toxic		ACETONE
WATER	Incompatible ■ Corrosive Generates gas Generates heat Intense or explosive reaction Toxic	Compatible ■	WATER
GASOLINE	Incompatible ■ Corrosive Flammable Generates gas Generates heat Intense or explosive reaction Toxic	Compatible ■	Compatible ■

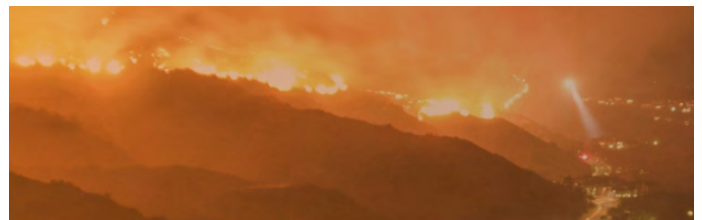
Other chemical safety information databases:

- [NIOSH Pocket Guide to Chemical Hazards](#)
- [Pistoia Alliance Chemical Safety Library \(CSL\)](#)
- [PubChem](#) | [Laboratory Chemical Safety Summary](#) datasheets
- [WebWISER](#) (Wireless Information System for Emergency Responders) from the National Library of Medicine was discontinued as of February 28th, 2023.

Related resources:

- [ACS Center for Laboratory Safety](#)
- [CHEMM \(Chemical Hazards Emergency Medicine Management\)](#) (from U.S. Department of Health and Human Services)
- [Emergency Response Guidebook](#) (from U.S. Department of Transportation. Pipeline and Hazardous Materials Safety Administration)
- [Comparison of NFPA 704 and HazCom 2012 Labels](#) | [Frequently Asked Questions on NFPA 704](#)
- Spill reporting information: [Overview of Release Reporting Requirements for EPCRA \(Emergency Planning and Community Right-to-Know Act Section 304\) & CERCLA \(Comprehensive Environmental Response, Compensation, and Liability Act Section 103\)](#) | [State Release Reporting Information](#) | [National Response Center \(NRC\)](#) | NRC Spill Reporting Hotline: 800-424-8802
- [U.S. Environmental Protection Agency > CAMEO](#)
- [U.S. National Oceanic and Atmospheric Administration \(NOAA\). Office of Response and Restoration > Chemical Spills](#)

Emergency Preparedness Collection



“Even prepared communities can be overwhelmed in a state of state of emergency. This collection of reports provides guidelines and targeted resources for all stakeholders in a disaster response, including state and local governments, emergency medical services and health care centers. These reports also examine the improvement of emergency services in rural communities and recommends post-disaster public engagement practices.”

[View this collection](#) of free online resources from the National Academies of Sciences, Engineering, and Medicine.

Interesting and Cool Science in the News

Advancing progress in the fight against fentanyl (CAS Insights, May 9, 2023)

American Chemical Society honors first Black American woman to earn a chemistry Ph.D. (ACS Press Release, May 16, 2023)

Beer byproduct used as a binder in paintings during the Danish Golden Age (Chemistry World, May 26, 2023)

Beneath the Earth, ancient ocean floor likely surrounds the core (NSF Research News, May 10, 2023)

Brain Fog (Stanford News, May 11, 2023)

Can synthetic polymers replace the body's natural proteins? (NSF Research News, May 23, 2023)

Carbon 'bank' at risk of failure (NSF Research News, May 16, 2023)

Challenges and opportunities in structure-activity-relationship (SAR) studies (CAS Insights, May 23, 2023)

ChatGPT in Research and Education: Continuing the Conversation (ACS Axial, May 22, 2023)

China displaces US as top publisher of high-quality natural science studies (Chemistry World, May 25, 2023)

Chronic stress can inflame the gut — now scientists know why (Nature news, May 25, 2023)

An edible CBD coating could extend the shelf life of strawberries (ACS Press Release, May 17, 2023)

Efforts to cut methane are hobbled by gaps in coverage and uncertainty on emissions (Chemistry World, May 23, 2023)

Experiments shed light on pressure-driven ionization in giant planets and stars (SLAC News, May 24, 2023)

Friend, not foe: Harnessing the gut microbiome for health benefits (CAS Insights, May 19, 2023)

In a first, researchers capture fleeting "transition state" in ring-shaped molecules excited by light (SLAC News, May 25, 2023)

'Magnificent' feathers reveal nature-inspired method to hold and store liquids (NSF Research News, May 15, 2023)

Mediterranean diet's cellular effects revealed (Stanford Medicine News, May 9, 2023)

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A new material could enable more efficient magnet-based computer memory (Stanford News, May 5, 2023)

New nontoxic powder uses sunlight to quickly disinfect contaminated drinking water (Stanford News, May 18, 2023)

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Optical microscopy with Ångström resolution could revolutionise how we see life (Chemistry World, May 25, 2023)

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Soft 'e-skin' generates nerve-like impulses that talk to the brain (Stanford News, May 18, 2023)

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To study aging, researchers give killifish the CRISPR treatment (Stanford News, May 16, 2023)

Traditional medicine plant could combat drug-resistant malaria (ACS Press Release, May 11, 2023)

Tweaked nausea drug gets into cells for lasting pain relief (Futurity, May 24, 2023)

The Ultimate Guide for PEGylated Lipid Nanoparticles (CAS Insights, May 26, 2023)

US supreme court confirms Amgen's cholesterol antibody patents invalid (Chemistry World, May 24, 2023)

Using science to help avocados stay fresh (ACS Press Release, May 11, 2023)

What's the deal-O with new weight loss drugs? Part 1 (Stanford Medicine, Scope Blog, May 22, 2023)

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THE CHEMISTRY OF ICE CREAM

Ice cream is a combination of air, ice crystals, fat globules, and a liquid syrup. These are combined to make a colloid, a solution with very small insoluble particles suspended in it. This graphic looks in detail at the components of this colloid, and some molecules that produce ice cream flavours.

FATS, PROTEINS, & EMULSIFIERS



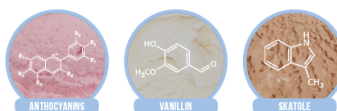
Fats are important for the creaminess of ice cream. Proteins from milk form a membrane around the fat droplets, making it harder for them to come in contact with each other. Emulsifiers replace some milk protein on the surface of the fat droplet. As ice cream is made, some of the fat in the droplet solidifies, and the fat 'needles' that form help droplets to partially cluster. These clusters, along with milk proteins, help stabilise air bubbles in the ice cream.

THE STRUCTURE OF ICE CREAM



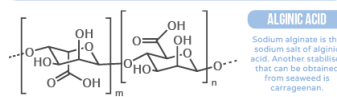
During freezing, most water is frozen into ice. Small ice crystals are needed for smooth ice cream. Beating and aeration occur at the same time as freezing to form small air bubbles, stabilised by de-emulsified fat. Air makes up 30-50% of ice cream's final volume. Sugar sweetens the ice cream, and lowers the freezing point of water, reducing the amount of ice. Soft ice cream contains less ice.

FLAVOURS AND COLOURS



Natural ice cream flavours contain a number of flavour-contributing compounds. Flavouring can also be achieved artificially. Artificial vanilla flavouring is often simply vanillin; other artificial flavours are more complex. Other compounds can be used as flavour enhancers – an unusual example is skatole, also found in faeces, but which has a floral odour at lower concentrations. Colours can be added artificially; anthocyanins from plants are amongst the colouring agents used.

STABILISERS



Stabilisers are added in small amounts (~0.2%) to ice cream. Often extracted from plants, a common example is sodium alginate, the sodium salt of alginic acid, extracted from brown seaweeds. Stabilisers reduce the rate at which ice cream melts, add smoothness, and increase the viscosity of the liquid phase of ice cream. Use of multiple stabilisers can produce synergistic effects.

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