

SILICON VALLEY CHEMIST

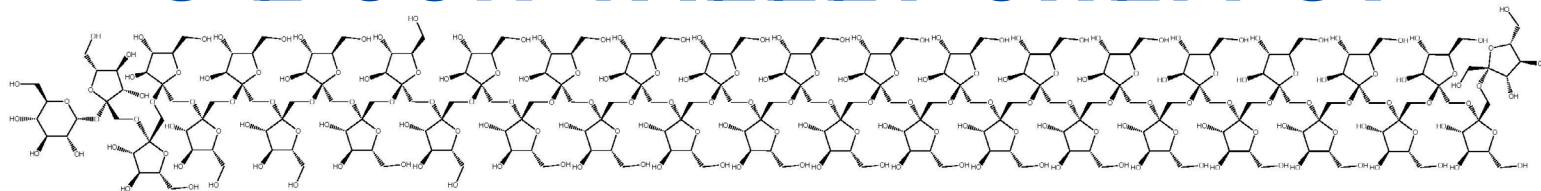


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**Silicon Valley ACS
Annual Picnic & Awards**

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



For information go to
<https://www.siliconvalleyacs.org/event/annual-picnic-and-awards-ceremony/>

Chair's Message

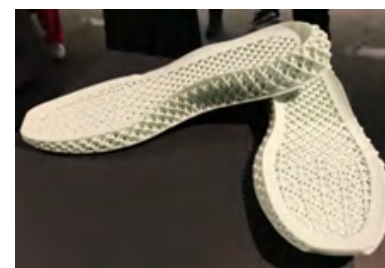
Natalie McClure



It's hard to believe but the summer is already upon us. Our July picnic will soon provide our annual opportunity to mingle, enjoy each other's company, and meet new people. If you aren't able to stop by, watch for pictures in the August newsletter and put the event on your calendar for next year's July.

Last month, at the joint meeting held with Golden Gate Polymer Forum, Joe DeSimone gave an extremely interesting

talk on the newer technologies involved with 3D printing. This isn't a field that I follow closely, so I was captivated to hear about the advances being made. Who knew that the matrixed soles of some Adidas shoes are manufactured using 3D printers. Or that dentures could be easily prepared and custom fitted individually with this optical variant on 3D printing. One of its real strengths is the ability to customize the work, simply by reprogramming the printer, rather



continued on next page

Chair's message, continued from the front page

than fabricating new equipment. This technology is a great example of the hidden impact of chemistry on everyday life.

The next big event for ACS will be the Fall National meeting at the Moscone Center in San Francisco August 13-17. The theme of the meeting is "Harnessing the Power of Data" which is particularly relevant in the Bay Area. **Register!** Our section has been very involved in arranging the Kids Zone, a hands-on family event on Saturday, August 12 at the Children's Creativity Museum in Yerba Buena Gardens, close to Moscone. We will also be represented with a poster outlining our section's activities at Monday evening's Sci-Mix poster session. SVACS is a finalist in the Outstanding Section (Large) category of ChemLuminary awards to be celebrated at an event open to all national meeting attendees and described in my **June Chair's Message**. Please join us at one or more of these events.

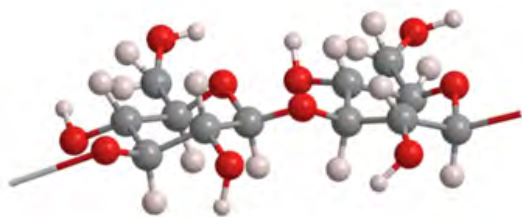
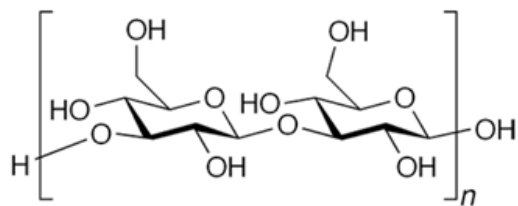
Another **fun event** to add to your summer calendar is a day at the Oakland Coliseum to cheer on the SF Giants vs. the Oakland A's on August 5. This is hosted by the California section and they have invited us to join them. This is your chance to enjoy the game with ACS colleagues before the A's depart the Bay Area. Buy tickets [here](#).

The section is looking for volunteers to join our SVACS leadership group, the Executive Committee (Ex Comm), or to help organize and run some of our events. We have positions available on the Nominations committee, the Program committee, and to do public outreach. The Ex Comm is our section's corporate governance committee and we are looking for individuals to participate as Councilors or as Chair elect. If you are interested in joining any of the committees, please contact any Ex Comm member, listed on the last page of the newsletter. This is a great way to meet other chemists and do some networking. We are also always interested in suggestions on how to improve the section to meet your needs and interests. **Speak up!**

CHEMISTRY

Quiz

I come from a tiny plant, but I could be a big seller.
What molecule am I?



Answer

CALENDAR OF EVENTS

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

- July 2023 -

- Jul 6** **Silicon Valley Executive Committee Meeting (Virtual)**
7-9pm. Open Meeting. Please contact **Chair** to attend as a guest.
- Jul 8** **Annual ACS Silicon Valley Picnic and Awards**
4-7pm, Cuesta Park Group BBQ Areas #1-2, Mountain View
Registration required by July 5 to order food & drink
Learn more and **download flyer**
- Jul 12** **Chemistry and the Economy: 2023 Mid-Year Review**
Sponsored by ACS Webinars, ACS Industry Member Programs, and ACS Business Development & Management Division
11am-Noon, Online via Zoom, Free, **Registration required**
- Jul 13** **How Student Feedback Can Help Us Teach Better**
Sponsored by ACS Webinars and ACS Education
11am-Noon, Online via Zoom, Free, **Registration required**
- Jul 15** **Kid Makers: Pop Up Chemistry for Middle School Scientists**
Sponsored by Silicon Valley ACS and Redwood City Public Library
Location: Redwood City Downtown Library, 1044 Middlefield Rd,
Free, **Learn more**
- Jul 27** **The Art of Securing Research Funding: Crafting Effective Grant Proposals**
Sponsored by ACS Webinars, ACS Office of Research Grants, and ACS Petroleum Research Fund
11am-Noon, Online via Zoom, Free, **Registration required**

- August 2023 and Beyond -

- Aug 5** **CALACS Day at the Oakland Coliseum – Oakland A's Vs SF Giants**
Sponsored by the ACS California Section
4pm, Oakland Coliseum, 7000 Joe Morgan Way, Oakland, CA 94621,
\$26.95, **Registration required** (Registration deadline: no later than Noon on August 3rd).
- Aug 12** **Kids Zone: Hands on Chemistry for Kids**
Hosted by ACS President Judith C. Giordan
10am-1pm, **Children's Creativity Museum**, 221 4th Street,
San Francisco, Free
Learn more and register
- 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**

Carolyn Bertozzi awarded the 2024 ACS Priestley Medal



Carolyn Bertozzi

Image credit: Christopher Michel/Stanford University

Reprint of an ACS Press Release, June 21, 2023

“The American Chemical Society (ACS) is pleased to announce that Carolyn R. Bertozzi is the recipient of the 2024 *Priestley Medal*. The medal is the highest honor awarded by ACS and annually recognizes an individual for distinguished services to chemistry. Bertozzi receives the award “for pioneering research in bioorthogonal reactions and their applications in studying living organisms and developing therapeutics, and for mentoring a generation of outstanding chemists.”

A talented, accomplished and passionate chemist, Bertozzi has received dozens of awards

and honors, including the 2022 Nobel Prize in Chemistry, which she shared with Morten Meldal and K. Barry Sharpless.

Through her ingenious and prolific research, Bertozzi created the field of bioorthogonal reactions, which opened the doors to studying disease at the molecular level. This breakthrough has allowed for chemical manipulations inside of living cells without disrupting their operations, thus promoting more effective means of developing chemical tools to address diseases like cancer, inflammation, tuberculosis and viral infections such as COVID-19.

Bertozzi holds several positions at Stanford University: Baker family director of Stanford ChEM-H; Anne T. and Robert M. Bass professor in the school of humanities and sciences; and professor, by courtesy, of chemical and systems biology and of radiology. She earned her undergraduate degree in chemistry from Harvard University and a PhD in chemistry from the University of California, Berkeley.

Wendy Young, former senior vice president, Genentech, and drug discovery veteran who serves as an advisor to Google Ventures and several private biotechnology companies, underscores the importance of Bertozzi’s biochemistry breakthroughs and awards and notes, “In addition to mentoring dozens of top outstanding scientists, collaborating with numerous researchers, and founding start-up biotechnology companies to bring the fruits of her research to curing human disease, she is a tireless and outspoken advocate and leader in promoting diversity in chemistry, including women and members of the LGBTQ+ community.”

Madeleine Jacobs, former ACS executive director and CEO and former editor in chief of Chemical & Engineering News, who has closely followed Bertozzi’s career for several decades, says, “Carolyn is a consummate mentor, having trained more than 150 PhD students and postdoctoral fellows who populate U.S. university faculties. She makes time to encourage young people to choose science as a career.”

Bertozzi will accept the medal and deliver an address at ACS Spring 2024 in New Orleans.

Nominations for the 2025 Priestley Medal are open through Nov. 1, 2023. To nominate a colleague, visit the [ACS National Awards page](#).”

An Insider/Outsider Journey Life Reflections with Nobel Laureate Carolyn Bertozzi



ACS Webinar – Watch On Demand

“The Nobel Prize in Chemistry is a remarkable honor bestowed upon 191 distinguished laureates that has been awarded 114 times throughout its history spanning from 1901 to 2022. Startlingly, a mere eight female chemists have been recognized, with half of them winning within less than a decade.

Against this traditional backdrop, the groundbreaking achievement of [Carolyn Bertozzi](#), esteemed Professor at Stanford University, cannot be overstated. Her pioneering work in click chemistry and bioorthogonal reactions

has revolutionized the field by demonstrating that molecular building blocks can seamlessly snap together inside a living organism without disrupting delicate cell biology.

Listen to 2022 Nobel Laureate Carolyn Bertozzi in her thought-provoking speech about her journey from privileged beginnings as the daughter of a MIT professor to overcoming systemic roadblocks in chemistry education on her road to becoming a world-renowned chemist, the surprising ways her life changed during the days of the announcement, and what she hopes can be accomplished to bring more people to chemistry.”

ACS Funding and Award Opportunities and Deadlines!

The ACS offers funding to advance the chemical sciences through research, education, and community projects. Award programs support excellence in chemistry, celebrate achievements, and provide opportunities for exploration and advancement.

Bookmark the [ACS National website of awards and their deadlines](#) so you don't miss deadlines to reach out for opportunities or to



celebrate colleagues.

Below are a few of the upcoming opportunities:
Chemical Technician Affairs Leadership Development System Course Award Amount: Variable. Deadline: July 15, 2023

To support leadership development of a chemical technician or chemist by covering the cost of an ACS Leadership Development System course at an ACS Meeting.

CCS High School Chemical Safety Grant Amount: Up to \$3,000. Deadline: August 1, 2023

The purpose of the CCS High School Chemical Safety Grant is to promote chemical safety excellence in secondary education in one of the following areas: integrating chemical safety into curriculum, advocating for safe chemical practices,

and improving chemical safety infrastructure.

Stanley C. Israel Regional Award for Advancing Diversity in the Chemical Sciences Amount: \$1,000 plus expenses. Deadline: August 1, 2023

To recognize individuals and/or institutions who have advanced diversity in the chemical sciences and significantly stimulated or fostered activities that promote inclusiveness within the region.

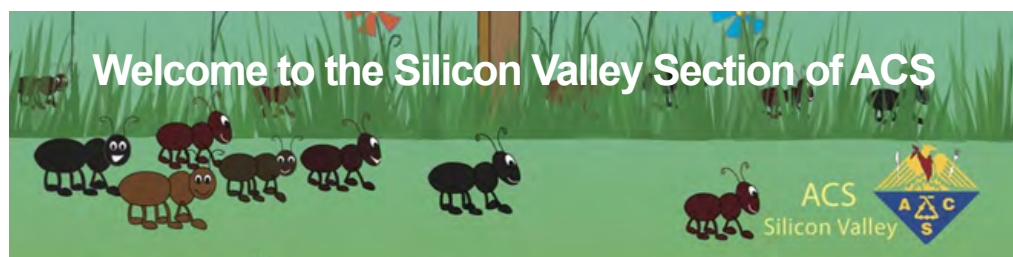
Teaching Green Fellowship Amount: \$15,000 plus travel. Deadline: September 1, 2023.

To recognize innovation and creativity in the development of new and/or significantly updated curricular materials infused with green chemistry and/or sustainability concepts.

Early Career Postdoctoral-Faculty Bridge Grant Amount: \$125,000. Deadline: September 15, 2023

This award provides a post-doctoral associate who plans to launch an independent research career in academia funds to support a post-doctoral associate/fellow for two years once their new research group is launched.

Browse [all ACS funding and award opportunities](#) and learn how to apply.



Each month, our Silicon Valley local ACS 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 a free dinner at a catered SVACS event. Come join us at our in-person dinner meetings! 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!

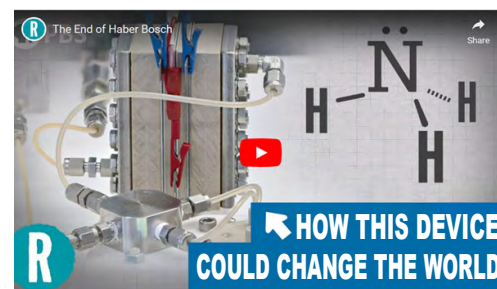
NEW ACS MEMBERS

Leonid Andronov
Joshua Arens
Chenoa Dara Arico
Lara Cala Alvarez
Chiu-Chun Chou
Surasak Chunsrivivort
Theresa Clarkson
Reanne Dela Cruz
Ron Dror
Deeba Ensan
Jason Fang
Katelynn Fichou
Elissa Fink
Thomas Sheldon Fisher
Beverly A. Freeman
Yale Huang

Dhruv Deepak Jatkar
Akos Kokai
Aravindh Kumar
Lexi Langtry
Won Young Lim
Baldwin Liwanag
Karan Maindan
Antara Mallick
Yutaka Matsuda
Siavash Moghadami
Mariko Morimoto
Renato Navarro
Tina Nguyen
Leila Parker
Josh Perfetto
Katarzyna Piechowicz

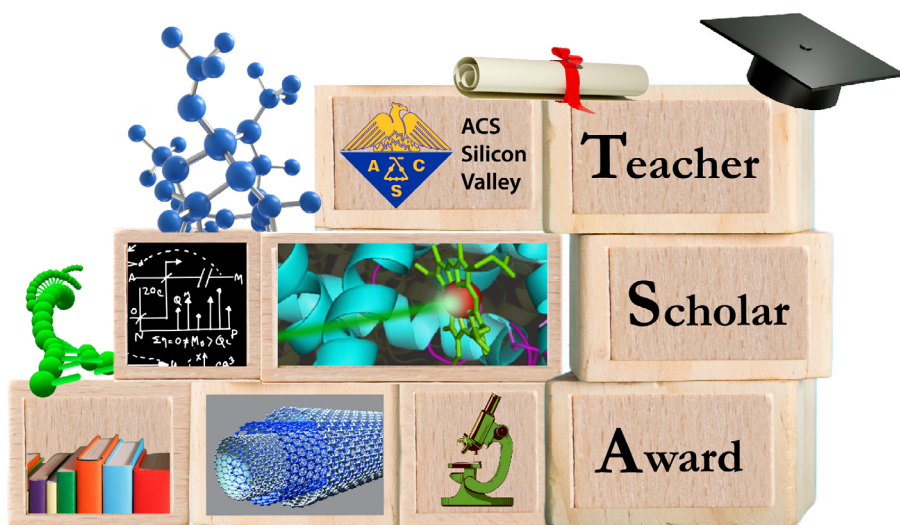
Ilhan Raja
Xu Ran
Colin Reid
Nikka Sekelj
Earl Roby Shelton
Zain Syed
David Tang
Doris Tang
Khoi Tran
Rushia Turner
Vasil Hristov Vasilev
Johannes Voss
Deepali Waghray
Oriol Zagazeta
Zhe Zhuang

The end of Haber Bosch (video)



"Billions of people rely on a single, hundred-year-old chemical reaction every day: the Haber-Bosch process. This simple, short reaction consumes 1% of the world's energy supply and releases 2% of its carbon dioxide emissions. Chemists have been trying to come up with a fundamentally better way to fix nitrogen for over a century. Have they finally succeeded?" (Reactions Science video, 13.50 minutes, published June 26, 2023)

[Watch on YouTube](#)



Who are we members of the ACS? Find out in the ACS Membership Demographics Report

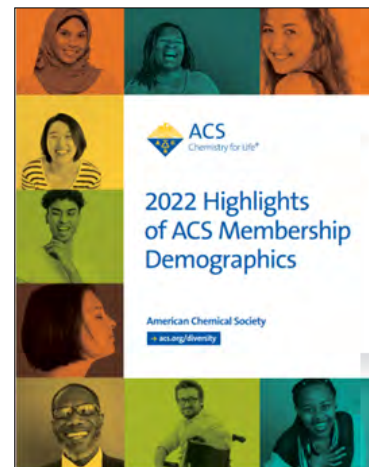
Recognizing Community College science teachers who go above & beyond to inspire and support their students to pursue a career in science.

Join us at the **annual SVACS picnic on Saturday, July 8**, to celebrate TWO community college chemistry teachers: Rushia Turner of Monterey Peninsula College and Asmik Oganessian of Glendale Community College.

Learn more about these amazing recipients in the **June 2023 SVACS newsletter**

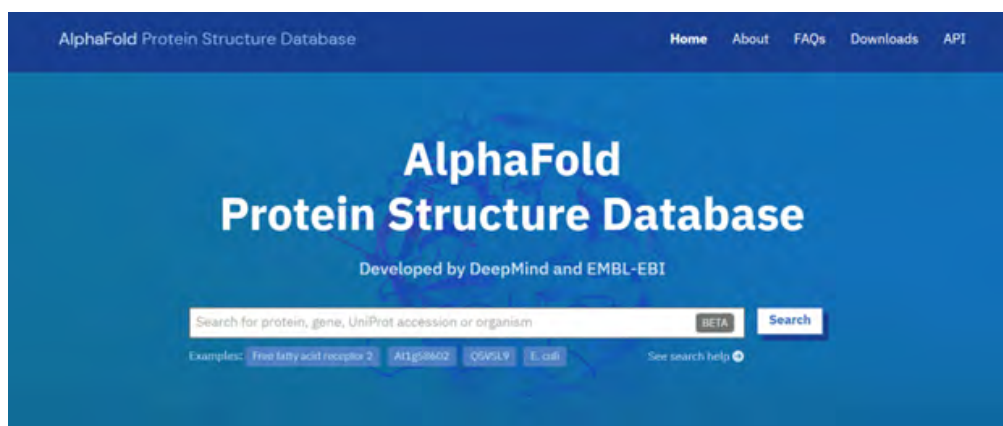
The California Community College system is the largest system of higher education in the country, serving 1.8 million students. To recognize the invaluable contributions of community college faculty, the Silicon Valley ACS created the **Teacher-Scholar Award** to honor community college faculty who demonstrate excellence in teaching, mentoring and scholarship and/or who make impactful contributions to their communities through outstanding leadership and service.

This is an annual award, so step up now and **nominate** a deserving California community college science educator.



As part of its commitment to embracing and advancing inclusion in chemistry, ACS has published the 2022 Membership Demographics Report. It is the first membership diversity data report from the ACS Office of Diversity, Equity, Inclusion, and Respect and ACS Society Business Solutions that describes who makes up the ACS community. [View the report](#)

AlphaFold Protein Structure Database



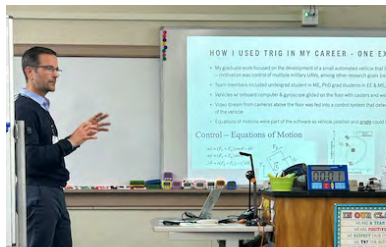
AlphaFold DB provides open access to over 200 million protein structure predictions to accelerate scientific research. [Search AlphaFold](#)

“**DeepMind** and EMBL’s European Bioinformatics Institute (**EMBL-EBI**) have partnered to create AlphaFold DB to make these predictions freely available to the scientific community. The latest database release contains over 200 million entries, providing broad coverage of **UniProt** (the standard repository of protein sequences and annotations). AlphaFold provides individual **downloads** for the human proteome and for the proteomes of 47 other key organisms important in research and global health. AlphaFold also provides a download for the manually curated subset of UniProt (**Swiss-Prot**).”

Contemplating a Career Change into Teaching?

Share your STEM expertise to give students in under-resourced communities equitable access to a high-quality STEM education

<https://encorps.org>



EnCorps STEM Teachers

SINCE OUR FOUNDING IN 2007

80%

5+ year EnCorps teacher retention rate (national average is 50%)

EnCorps
IGNITE A PASSION FOR STEM



EnCorps
LEARNING SUMMIT 2023

86%
OF STUDENTS
IN THE PROGRAM
IMPROVED MATH PROFICIENCY
2022-23 ACADEMIC YEAR

EnCorps STEMx Tutors

200 Top-Selling Drugs in 2022

Compiled by **Ryan Williams** and **Christopher Marshall**, Njardarson Group, University of Arizona

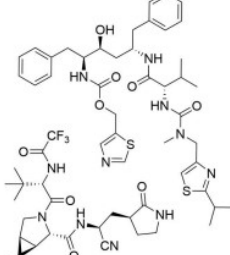
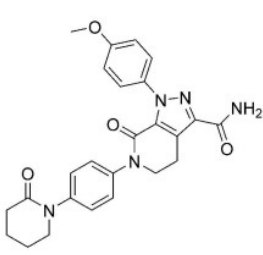
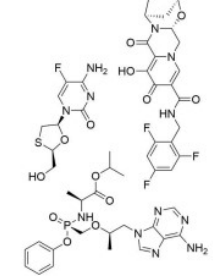
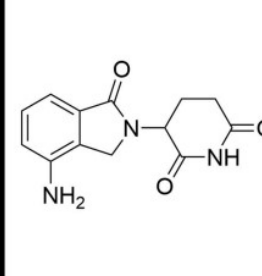
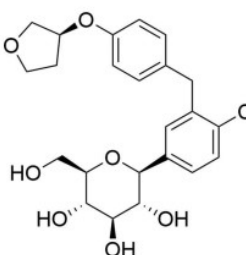
“As part of efforts to educate students about how chemistry positively impacts our lives, the University of Arizona Njardarson research group has created pharmaceutical posters, a snippet of which is shown below. The full posters can be downloaded for free as high-resolution PDF files from the [Njardarson group website](https://njardarsonlab.org).

They envisioned that this attractive graphical information would be a useful tool for teaching both undergraduate and graduate students in addition to serving as a springboard of ideas for researchers interested in the development of new synthetic methods and strategies. They hope everyone appreciates

these posters and encourage all visitors to download and use them for teaching, fun chemical browsing, research purposes or even as an attractive and accessible graphical summary to help communicate to the public the critical role organic chemistry plays in the development of new medicines.”

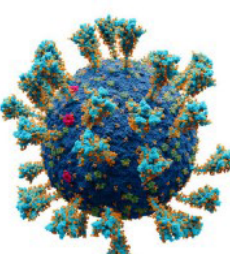
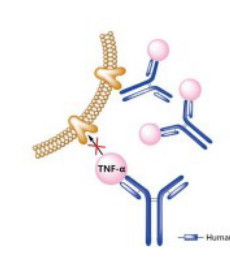
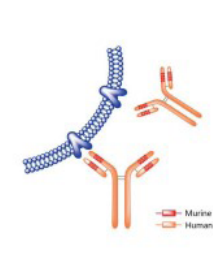
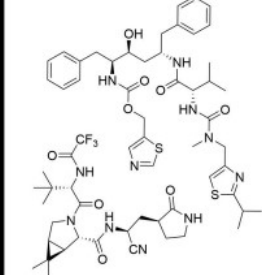
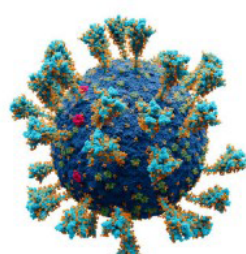
Top 200 Small Molecule Drugs by Retail Sales in 2022

Compiled by Ryan Williams and Christopher Marshall, Njardarson Group, University of Arizona

1	2	3	4	5
Paxlovid (Ritonavir/Nirmatrelvir)	Eliquis (Apixaban)	Biktarvy (Bictegravir/Emtricitabine/Tenofovir Alafenamide)	Revlimid (Lenalidomide)	Jardiance (Empagliflozin)
				
\$18.933 Billion	\$11.789 Billion	\$10.390 Billion	\$10.061 Billion	\$8.388 Billion
Infectious Diseases	Cardiology/Vascular Diseases	Infectious Diseases	Oncology	Diabetes

Top 200 Brand Name Drugs by Retail Sales in 2022

Compiled by Ryan Williams and Christopher Marshall, Njardarson Group, University of Arizona

1	2	3	4	5
Comirnaty (COVID-19 Vaccine)	Humira (Adalimumab)	Keytruda (Pembrolizumab)	Paxlovid (Ritonavir/Nirmatrelvir)	Spikevax (CX-024414)
				
\$37.806 Billion	\$21.237 Billion	\$20.937 Billion	\$18.933 Billion	\$18.435 Billion
Infectious Diseases	Immunology	Oncology	Infectious Diseases	Infectious Diseases

Source: <https://njardarson.lab.arizona.edu/content/top-pharmaceuticals-poster> (accessed 2023-07-04).

Interesting and Cool Science in the News

All-electric rideshare fleet could reduce carbon emissions, increase traffic issues (ACS News Release, June 12, 2023)

'Almost magical': chemists can now move single atoms in and out of a molecule's core (Nature News, May 31, 2023)

Bigger bottles keep champagne bubbly for decades (ACS News Release, June 27, 2023)

Chemical firms kept data on PFAS health hazards secret (Chemistry World, June 2, 2023)

Chocolate can be fruity or flowery — if you skip the roasting step (ACS News Release, June 27, 2023)

Color-changing material shows when medications get too warm (ACS News Release, May 31, 2023)

Conformer-Dependent Reactivity of Carbonyl Oxides Leads to Dramatically Different Atmospheric Fates (DOE Office of Science News, May 3, 2023)

Contact lenses shed microplastics (ACS News Release, June 15, 2023)

Copper artifacts unearth new cultural connections in southern Africa (NSF Research News, June 20, 2023)

Creating less-allergenic shrimp using pressure and steam (ACS News Release, June 7, 2023)

CRISPR and single-cell sequencing pinpoint causal genetic variants for traits and diseases (NSF Research News, June 15, 2023)

Cutting boards can produce microparticles when chopping veggies, study shows (ACS News Release, June 1, 2023)

Directly Imaging Quantum States in Two-Dimensional Materials (DOE Office of Science News, June 20, 2023)

DOE Report Finds Clean Energy Jobs Grew in Every State In 2022 (DOE News, June 28, 2023)

First study to quantify the total carbon sequestration for a region of the ocean (NSF Research News, June 26, 2023)

Foldseek gives AlphaFold protein database a rapid search tool (Nature, June 29, 2023)

The future of greenhouse gases (podcast) (Stanford Engineering News, June 2, 2023)

'Heat highways' could keep electronics cool (ACS Press Release, June 6, 2023)

Helping 'good' gut bacteria and clearing out the 'bad' — all in one treatment (ACS News Release, June 21, 2023)

Hidden in plain sight: Windshield washer fluid is an unexpected emission source (ACS News Release, May 30, 2023)

Improving X-Ray Analysis with Artificial Intelligence (DOE Office of Science News, June 1, 2023)

Large study provides scientists with deeper insight into long COVID symptoms (NIH News, May 25, 2023)

Machine Learning-Based Protein Annotation Tool Predicts Protein Function (DOE Office of Science News, May 17, 2023)

The 'magic molecule' produced when we exercise (podcast) (Stanford Wu Tsai Neurosciences Institute, June 26, 2023)

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

Modeling early heart failure could help researchers develop new treatments (ACS News Release, June 20, 2023)

The next generation of solar energy collectors could be rocks (ACS News Release, May 30, 2023)

New method offers unprecedented detail in tracking protein activity in living cells (Stanford News, June 28, 2023)

New model provides never-before-seen views of atmospheric aerosols (video) (ACS Headline Science, June 29, 2023)

New Strategy Can Harvest Chemical Information on Rare Isotopes with a Fraction of the Material (DOE Office of Science News, May 25, 2023)

NIH's ComboMATCH initiative will test new drug combinations guided by tumor biology (NIH News, June 1, 2023)

NSF announces \$6 million investment in semiconductor fabrication (NSF News, June 29, 2023)

NSF invests \$162 million in research centers to accelerate materials science from lab to factory (NSF News, June 26, 2023)

PAINTing a wound-healing ink into cuts with a 3D-printing pen (ACS News Release, June 1, 2023)

PFAS: Fighting Chemistry with Chemistry (ACS Axial, June 13, 2023)

A 'pinch' of mineral salts helps the noncaloric sweeteners go down (ACS News Release, June 15, 2023)

Postdoctoral researchers warn NIH that cost-of-living pressures are gutting the workforce (Nature career news, June 29, 2023)

Psychological Safety in Engineering Starts with Diversity, Equity, and Inclusion (NAE Perspectives, June 13, 2023)

Recent Progress Toward an HIV-1 Vaccine (ACS Axial, June 20, 2023)

Recycling plastic with enzymes (Chemistry World, June 27, 2023)

Reducing Risk: Strategies to Advance Laboratory Safety through Diversity, Equity, Inclusion, and Respect (Journal of the American Chemical Society Editorial, May 31, 2023)

Researchers show how a tumor cell's location and environment affect its identity (NIH News, June 23, 2023)

Scientists Develop Inorganic Resins for Generating and Purifying Radium and Actinium (DOE Office of Science News, June 7, 2023)

Scientists discover clues to aging and healing from a squishy sea creature (NIH News, June 30, 2023)

Scientists discover easy way to make materials with atomically thin metal layers (NSF Research News, June 27, 2023)

Smart surgical implant coatings provide early failure warning while preventing infection (NSF Research News, June 15, 2023)

Squid-inspired soft material is a switchable shield for light, heat, microwaves (ACS News Release, June 28, 2023)

Stanford researchers discover that heat-damaged DNA in food cooked at high temperatures could pose cancer risk (Stanford News, June 12, 2023)

Start-ups are adding antacids to the ocean to

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slow global warming. Will it work? (Nature News, June 28, 2023)

Study finds combustion from gas stoves can raise indoor levels of chemical linked to a higher risk of blood cell cancers (Stanford News, June 16, 2023)

Study forecasts future nitrogen loads under various drainage and crop rotation scenarios

(NSF Research News, June 15, 2023)

Study presents new clues about the rise of Earth's continents (NSF Research News, June 15, 2023)

Tunable Bonds: A Step Towards Targeted At-211 Cancer Therapy (DOE Office of Science News, May 30, 2023)

Turn Your Skin into a Sketchpad with This New

Wearable Technology (ACS Axial, May 31, 2023)

Viruses Could Reshuffle the Carbon Cycle in a Warming World (DOE Office of Science News, May 8, 2023)

What's the deali-O Part 2: Navigating new weight loss drugs (Scope blog from Stanford Medicine, June 5, 2023)



Science.gov

Your Gateway to U.S. Federal Science

<https://open.science.gov>

Open Science Announcements from Federal Agencies

Open Science is the principle and practice of making research products and processes available to all, while respecting diverse cultures, maintaining security and privacy, and fostering collaborations, reproducibility, and equity.

Federal agencies are celebrating 2023 as a Year of Open Science, a multi-agency initiative across the federal government to spark change and inspire open science engagement through events and activities that will advance adoption of open, equitable, and secure science.

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2019 NOBEL PRIZE IN CHEMISTRY

The Nobel Prize in Chemistry 2019 was awarded jointly to John B. Goodenough, M. Stanley Whittingham and Akira Yoshino for the development of lithium-ion batteries.

CHARGE

Lithium-ion batteries power many of our electronic devices. When lithium-ion batteries charge, lithium ions and electrons move from the positive electrode to the negative electrode. When the battery is discharging, the opposite happens and the flow of electrons powers the device.

DISCHARGE

2 VOLTS

TITANIUM DISULFIDE | LITHIUM METAL

In the 1970s, Whittingham created the first functional lithium battery with a titanium disulfide cathode and lithium metal anode. The lithium metal made it explosive and unsafe.

4 VOLTS

COBALT OXIDE | LITHIUM METAL

In the 1980s, Goodenough used a cobalt oxide cathode instead of a metal sulfide. This doubled the battery's voltage, but it still contained lithium metal in the anode.

4 VOLTS

COBALT OXIDE | PETROLEUM COKE

Yoshino replaced the lithium metal anode with petroleum coke, a carbon-based by-product from the oil industry. This led to commercial lithium-ion batteries in 1991.

WHY DOES THIS RESEARCH MATTER?

Many of the devices we use are powered and made possible by lithium-ion batteries. They are also commonly used in environmentally friendly electric cars. Improvements to these batteries continue to be made.

Nobel Prize in Chemistry press release: <https://www.nobelprize.org/uploads/2019/10/press-chemistry-2019-2.pdf>

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Remembering John Goodenough who won the **2019 Nobel Prize in Chemistry**
Read his **obituary** that was published in C&EN, June 26, 2023

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