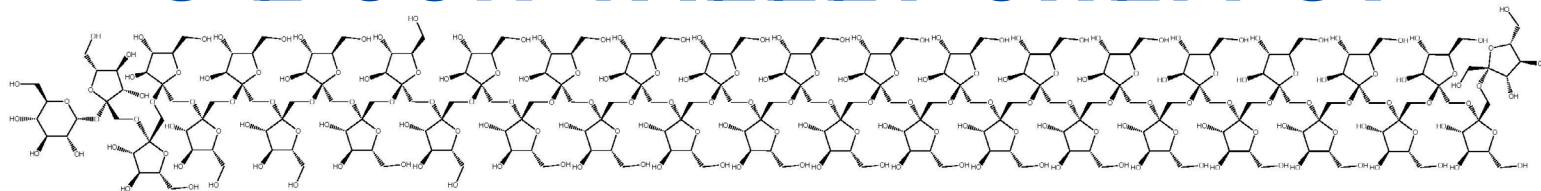


# SILICON VALLEY CHEMIST



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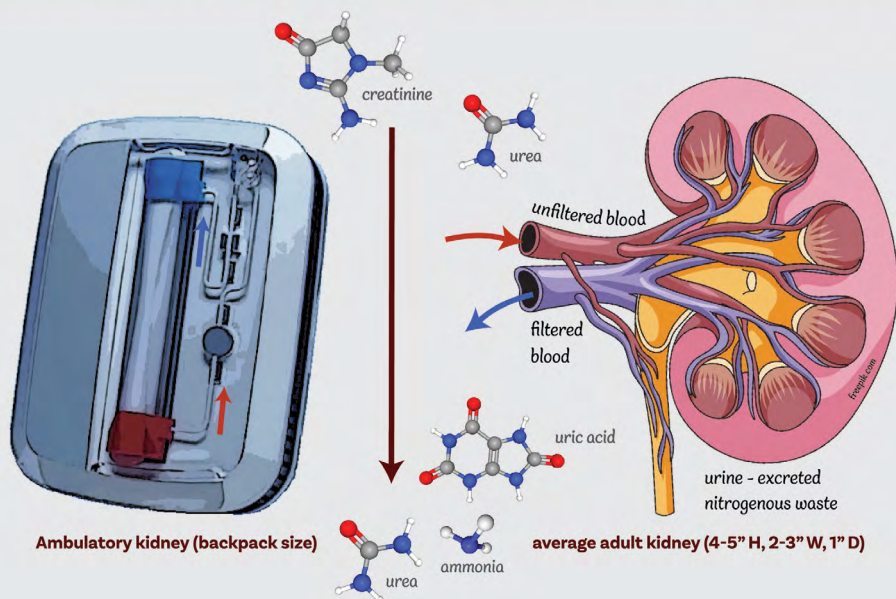
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## Joint GGPF/ACS Silicon Valley Seminar

### Innovations in Materials Design for Kidney Dialysis, from Lab Bench to Patient

Professor Buddy Ratner

Director, University of Washington Engineered Biomaterials



Monday, 24 June 2024 | 5-7 pm PDT

In-person Watch Party (all are welcome) hosted by Silicon Valley ACS at Stanford  
5-6 pm Networking with refreshments  
6-7 pm Zoom viewing

Registration required for Zoom link & for more information about the Watch Party  
Register by Sunday, 23 June at 1 pm - <https://ggpf.org/events/?ee=318>

GOLDEN GATE POLYMER FORUM



American Chemical Society  
Silicon Valley

#### Abstract:

Chronic hemodialysis on humans was first used successfully to address end-stage kidney disease (ESKD) in 1962 in Seattle. Since then, 4.5

million people worldwide have sustained their lives through dialysis treatments. However, the pain and complications of kidney dialysis are tragic

*continued on next page*

Joint GGPF/ACS Silicon Valley Seminar, continued from front page

for ESKD patients and the costs to society are huge (>\$130B/yr). Our research program at the University of Washington is focused on rethinking dialysis that has not changed significantly since 1962. We aim to develop an ambulatory dialysis system, the AKTIV (Ambulatory Kidney to Improve Vitality). To retool dialysis, we will need improved blood waste cleansing, painless blood access, new blood compatible materials, skin healing and prevention of biofilm formation. Polymers feature significantly in this development effort and are used to improve blood compatibility, reduce biofilm formation and improve skin healing. Enhancements that revolutionize how dialysis is performed will be discussed in this talk along with efforts to take innovation from the lab bench to

the patient.

#### Bio

At the University of Washington, Buddy Ratner is the Director of the UW Engineered Biomaterials Engineering Research Center, Michael L. and Myrna Darland Endowed Chair in Technology Commercialization, and Professor in Bioengineering and Chemical Engineering. His lab specializes in biomaterials used in medical devices and implants for tissues, organs and medical devices.

Dr. Ratner received his PhD in Polymer Chemistry from the Polytechnic Institute of Brooklyn. He is a member of the US National Academy of Engineering and a Fellow of the American Institute of Medical and Biological Engineering (AIMBE), the Society For Biomaterials,

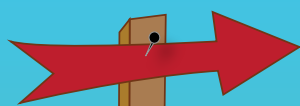


the AVS, the American Association for the Advancement of Science, and the Tissue Engineering and Regenerative Medicine International Society. He participated in the launch of numerous companies including

Healonics, Asemblon, and Kuleana Technology, focused on innovative dialysis devices. Dr. Ratner has authored >500 scholarly works and has >30 patents. Awards include UW Lifetime Inventor and Innovator, Acta Biomaterialia Gold Medal, ACS Polymer Division Distinguished Service Award, ACS Langmuir Lecture Award, Most Cited Paper Award in 2015 from the Annals of Biomedical Engineering, George Winter Award of the European Society for Biomaterials, and the Pierre Galletti Award of AIMBE.

## Silicon Valley ACS Annual Picnic & Awards

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



Saturday, 13 July 2024  
4-7 pm  
Cuesta Park Group BBQ  
Areas #1 & #2, Mountain View



For information go to  
<https://www.siliconvalleyacs.org/event/2024-annual-bbq-picnic-and-awards-ceremony/>  
Registration (deadline 9 July 2024) is required to make sure there is plenty of food.



## Volunteers Wanted for Tech Trek: A Hands-on STEM Event for 7th Grade Girls

**5-7 Volunteers Needed**

**Women Particularly Encouraged**

**Tuesday, July 9, 6-8 PM, Santa Clara University**

Tech Trek is designed to develop interest, excitement, and self-confidence in science, technology, engineering, and math (STEM) for young women who will enter eighth grade in the fall. We will have two consecutive groups of 40 girls do qualitative determination of Vitamin C in orange juice, lemonade, Red Bull, and other fluids. This is a huge chance for 80 local 7th grade girls to experience college life and see a real lab.

Help make this event a success by volunteering 2 hours of your time! Please contact **Natalie McClure**.

*Tech Trek is a program sponsored by the American Association of University Women (AAUW) that Silicon Valley ACS helps support.*

# CALENDAR OF EVENTS

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

- June 2024 -

- Jun 8** **Kid Makers: Pop Up chemistry**  
Sponsored by Silicon Valley ACS and Redwood City Public Library (RCPL)  
2:00-3:00 pm, In person for ages 9-12, RCPL Downtown Location,  
1044 Middlefield Road, Redwood City, Free, [Learn more](#)
- Jun 12** **Talking Science: Communicating Your Research to Diverse Audiences**  
Sam Jones, Executive Producer and co-host of ACS's science podcast  
"Tiny Matters"  
Sponsored by ACS Webinars and ACS Productions  
11:00 am-Noon, Online, Free, [Registration required](#)
- Jun 12** **See What's New in CAS SciFinder**  
Sponsored by CAS  
11:00 am-Noon, Online, Free, [Registration required](#)
- Jun 13** **Chemistry and the Economy: One Door Closes as Another Opens**  
Paul Hodges, New Normal Consulting, and Bill Carroll, Carroll Applied  
Science  
Sponsored by ACS Webinars, ACS Industry Member Programs, and ACS  
Division of Business Development and Management  
11:00 am-Noon, Online, Free, [Registration required](#)
- Jun 20** **Revealing Mona Lisa's Secrets Through Advanced Analytical  
Chemistry**  
Victor Gonzalez, French National Center for Scientific Research (CNRS)  
Sponsored by ACS Webinars and ACS Publications  
8:00-9:00 am, Online, Free, [Registration required](#)
- Jun 21** **The Wonders Of A 400 MHz HTS Magnet NMR System, How It Works  
And Our Results At Amgen**  
Dr. María Victoria Silva Elipe, Amgen  
Sponsored by California ACS Section  
10:00-11:00 am, Online, Free, [Registration required](#) | [Download  
flyer \(PDF\)](#)
- Jun 23-26** **2024 ACS Northwest Regional Meeting - "Breaking Borders: Building  
Bonds"**  
Sponsored by ACS Washington-Idaho Border Section  
In person, Washington State University, Pullman, Washington,  
[Learn more](#)
- Jun 24** **Innovations in Materials Design for Kidney Dialysis, from Lab Bench to  
Patient**  
Prof. Buddy Ratner, University of Washington  
Sponsored by the Golden Gate Polymer Forum and Silicon Valley ACS  
● 5:00-6:00 pm In-person networking with refreshments at Stanford  
before Zoom Watch Party  
● 6:00-7:00 pm Zoom presentation, virtual or in-person at Stanford  
Watch Party  
Free/\$5 Donation to GGPF, [Register for Zoom link or for in-person  
Watch Party location by June 23rd at 1:00 pm](#) | [Download flyer](#)
- Jun 26** **Inaugural State of the Science Address and Panel Discussion**  
Marcia McNutt, NAS President  
Sponsored by the National Academy of Sciences, Engineering, and  
Medicine (NAS)  
Noon-2:00 PM (Pacific Time), Online and In person, Free,  
[Learn more and Register](#)
- Jun 27** **Microbiome Mechanics: Building a Healthier Gut**  
Prof. Jordan Bisanz, Pennsylvania State University and the One Health  
Microbiome Center; Prof. Marcos Pires, University of Virginia; Prof.  
Jan Claesen, Cleveland Clinic and Case Western Reserve University;  
Prof. Catherine Leimkuhler Grimes, University of Delaware  
Sponsored by ACS Webinars and ACS Publications  
11:00 am-Noon, Online, Free, [Registration Required](#)
- July 2024 and Beyond -
- Jul 8** **Summer STEAM at the Library: Chemistry**  
Sponsored by Friends of the Redwood City Public Library and Silicon  
Valley ACS  
3:30-5:30 pm, In person for grades 3-8, RCPL Downtown Location, 1044  
Middlefield Road, Redwood City, Free, [Learn more](#)
- Jul 9** **Tech Trek: 5-7 Volunteers Needed**  
Sponsored by Silicon Valley ACS and American Association of University  
Women  
6:00-8:00 pm, In person for 7th Grade Girls, Santa Clara University  
To volunteer, please contact [Natalie McClure](#)
- Jul 13** **Silicon Valley ACS Annual Picnic and Awards**  
Cuesta Park Group BBQ Areas #1-2, Mountain View, California  
4:00-7:00 pm, Cost: \$10.00. Children: free. Pay with cash or check at  
the door. (Make checks out to "Silicon Valley ACS.")  
[Registration required](#) by July 9th at 1pm
- Jul 17** **How can ACS support your career as a Chemical Technical  
Professional?**  
Michelle Rivard, Dow, and Matthew Russell, Corteva Agrisciences  
Sponsored by ACS Webinars and ACS Committee on Technician Affairs  
11:00 am-Noon, Online, Free, [Registration required](#)
- Jul 18** **A Different Way of Thinking: How Students Who are Neurodivergent  
can Flourish in Science**  
Maria Dulay, Stanford University; Prof. Christin Monroe, Landmark  
College; Holden Thorp, Editor-in-Chief, *Science Family of Journals*  
Sponsored by ACS Webinars, ACS Chemists with Disabilities  
Committee, and the ACS Office of Diversity, Equity, Inclusion &  
Respect  
11:00 am-Noon, Online, Free, [Registration required](#)
- Jul 28** **Biennial Conference on Chemical Education (BCCE)**  
-Aug 1  
Sponsored by the ACS Division of Chemical Education (DivCHED)  
In person, University of Kentucky, Lexington, Kentucky, [Learn more](#)
- Aug 10** **Kid Makers: Pop Up Chemistry**  
Sponsored by Silicon Valley ACS and Redwood City Public Library (RCPL)  
2:00-3:00 pm, In person for ages 9-12, RCPL Downtown Location, 1044  
Middlefield Road, Redwood City, Free, [Learn more](#)
- Aug 18-24** **ACS Fall 2024 Meeting**  
Denver, Colorado & Hybrid, [Registration and Housing are Open](#)



# Chemists Celebrate Earth Week

The theme for CCEW in 2024 was “Electrochemistry—Get a Charge out of Chemistry”. The Silicon Valley section held a workshop at Martin Luther King Library in San Jose where over 90 kids and their families learned how to make a battery using cantaloupe, mangoes and zucchini (because potatoes and lemons are so last year!) to power a small clock. They discovered that graphite drawings and playdough snakes can be used to close circuits and light an LED or sound a buzzer. We also electrolyzed water into  $H_2$  and  $O_2$  gas. These experiments were conducted by student volunteers from Santa Clara University (SCU) together with Natalie McClure and Jigisha Shah from SVACS. This is our second post-COVID event at Martin Luther King Library and we plan to continue this fruitful collaboration.

In a second event, Anais Nguyen and Natalie McClure traveled to Salinas to work with the afterschool program at El Sausal Middle School, held by the Salinas Community Workshop. At the Salinas workshop, we electroplated coins, nuts/bolts and other small objects. One student wasn't pleased when we “turned the dime into a penny”. We haven't tried out copper plated quarters in a vending machine yet. That will be our next experiment.



A CO<sub>2</sub> “boo” bubble



Bridget Kowalczyk, MLK Children's Librarian



Jigisha Shah of the SVACS helps with a graphite circuit drawing



SCU student explains a playdough circuit



Cantaloupe and mango fruit batteries



SCU student explains water hydrolysis



Santa Clara University student volunteers who took selfies with Natalie McClure.

GET A  
**CHARGE**  
OUT OF CHEMISTRY



April 21-27, 2024 | #CCEW



**Congratulations to  
Celine S. from the Silicon Valley ACS Section, 1st Place Winner for Grades 3-5  
of the 2024 ACS Chemists Celebrate Earth Week (CCEW) Illustrated Poem Contest!**

*Cathode*

*Batteries hold power*

*Telling us the hour*

*When batteries are added to gadgets*

*Chemical reactions are habits*

*Electrons accumulate at the anode*

*Positivity gathers at the cathode*

*Electrons exit, powering our machine*

*Electrons and positive ions dance like a routine*

*Cathode*

*Anode*

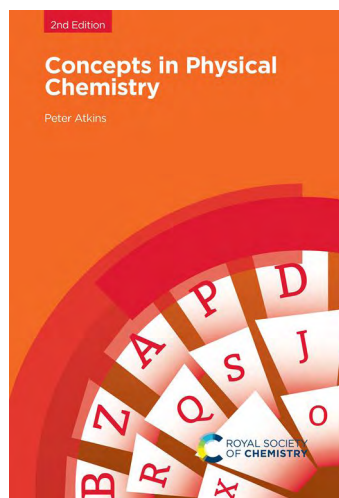
*Electrode*

*Cathode*

*Anode*

*Electrode*

# Peter Atkins Offers His Physical Chemistry Textbook Free as a 'Gift to the Chemistry Community'



This news was **reprinted** from University of Oxford's Department of Chemistry website.

Celebrated chemist and author Peter Atkins has opted to give the digital edition of his *Concepts of Physical Chemistry* textbook as a 'gift and a thanks', and to give all readers access to crucial material. The digital copy is available online for students around the world to access from 17 May 2024.

Coming 29 years after the publication of

the original, Atkins has made extensive changes for this new second edition of the book, which is available in print for £75.

Atkins said:

*"I've had a loyal following for my other books and so this really is just a gift and a thanks to the community. On reflection, I can also see that this is a way of reaching out to people who simply can't afford the big book."*

Atkins, who has written more than 70 books, said he was inspired to give away the textbook after seeing fellow author John McMurry adopt a similar approach with his *Organic Chemistry* book. He added that he held discussions with other free platforms but decided to publish with the RSC out of a sense of 'patriotism' and to 'give the [Royal Society of Chemistry] an opportunity to show itself off at its best.'

RSC Head of Books Andy Redman said of the innovative agreement:

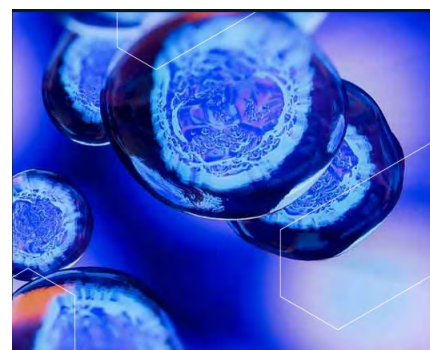
*"In a distinguished career Peter Atkins has worked to improve both the study of chemistry and the public understanding of chemical science. In keeping with those goals, Peter has produced a full revision*

*of Concepts in Physical Chemistry, a distinctive vade mecum which provides a succinct description for a selection of over 500 key concepts, set out in alphabetical order for ease of access. In partnership with the RSC, Concepts in Physical Chemistry is being made freely accessible in digital form as well as being available in a print edition to provide the next generation of chemists and the chemical community at large with an invaluable resource."*

Download or buy the second edition of *Concepts of Physical Chemistry* from the Royal Society of Chemistry (scroll down for the free alphabetized sections). <https://doi.org/10.1039/9781837674244>

## CAS BioFinder Discovery Platform Launched

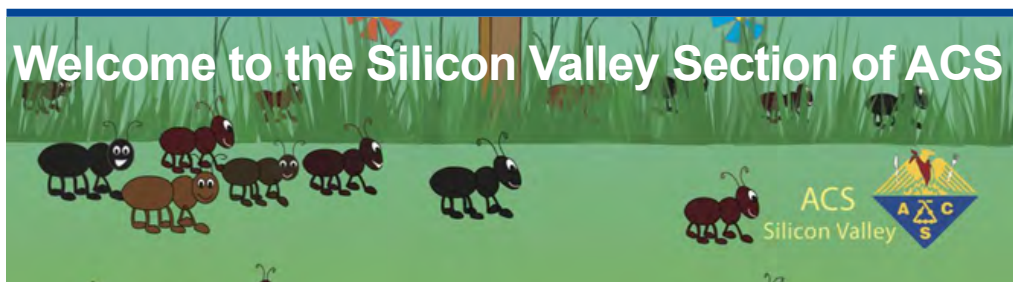
Move your drug discovery program to the next stage quickly and confidently with comprehensive access to published and predicted bioactivity data, ligand-protein interactions, biomarkers, and more.



### See the CAS (Chemical Abstract Service) Content Collection Through a Biological Lens

"Designed to support the needs of biology-based inquiry, the CAS BioFinder Discovery Platform adds new data types, connections, and visualizations to the CAS Content Collection. The platform includes a new CAS BioFinder solution with embedded predictive models, enhanced capabilities in CAS SciFinder, and access to comprehensive bioactivity and biomarker data through an application programming interface (API)."

[Learn more about CAS BioFinder](#)  
[Read Press Release](#)



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 free attendance at a catered SVACS event. Come join us at our in-person gatherings! To register as our guest for a catered 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.

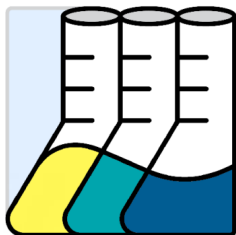
### New SVACS Members

Macon Jedidiah Abernathy  
Jaren Joel Benigno  
Jordan A Berg  
Emmanuel Toluwani Fasusi  
Ryan N. Lam

Yuanwei Li  
Glenn McGall  
Mohammad Mofidfar  
Neil Razdan  
Ryan Reeves

Marissa Kayla Salinas  
Hamidreza Sepasizangabadi  
Nathan Sprovieri  
Philip Yan  
Weize Yuan

## CAMEO Chemicals



CAMEO (Computer-Aided Management of Emergency Operations) Chemicals is developed jointly by the National Oceanic and Atmospheric Administration's (NOAA) [Office of Response and Restoration](#) and the Environmental Protection Agency's (EPA) [Office of Emergency Management](#)

The information below was reprinted from a newsletter sent by the CAMEO Team on May 31, 2024.

"A new version of CAMEO Chemicals is now available. You can access CAMEO Chemicals 3.1.0 in a variety of formats.

- Visit the [CAMEO Chemicals website](#) (or [mobile website](#))
- Download the [CAMEO Chemicals desktop program](#) for Windows or Mac
- Get CAMEO Chemicals as a [mobile app for iOS](#) devices on the App Store
- Get CAMEO Chemicals as a [mobile app for Android](#) devices on Google Play (3.1.0 is slightly delayed on Android; should be available soon)

Please note that some features vary by [format](#). If you have questions about this program update, please email [orr.cameo@noaa.gov](mailto:orr.cameo@noaa.gov).

### CAMEO Chemicals 3.1.0

CAMEO Chemicals is a database of hazardous chemical datasheets with response recommendations and physical properties for thousands of substances, and it also includes a tool for predicting possible hazards that could occur if chemicals mix and react with one another.

New changes in version 3.1.0 include:

- Updated to the newly released [2024 Emergency Response Guidebook \(ERG\)](#) data, including the ERG response guide PDFs in English, French, and Spanish.
- Added an address search feature to the mapping tool that plots initial isolation and protective action distances from the ERG. The map can be accessed from any UN/NA datasheet that has the ERG Table 1 (or Table 3) values from the green section. (This feature is similar to the one that had previously been available in WISER.)
- Updated data from several additional sources, including EPA regulatory data, NIOSH Pocket Guides, DuPont suit fabric breakthrough times, Hazmat Table (49 CFR 172.101) shipping data, International Chemical Safety Cards, and toxic Levels of Concern.
- Revised the help topics.
- Made additional minor changes and bug fixes.

Learn more:

- [EPA CAMEO Software Suite pages](#)
- [NOAA CAMEO Software Suite pages](#)
- [CAMEO Chemicals Fact Sheet \(PDF\)](#)
- [CAMEO Chemicals Help website \(User Guide\)](#)

## Safety Tipsheets & Best Practices

The ACS Committee on Chemical Safety (CCS) publishes a series of short, topical guides to help those who work in laboratories better understand the general aspects of laboratory and chemical safety. These documents provide basic guidelines for best laboratory practices, including risk management and accident prevention.

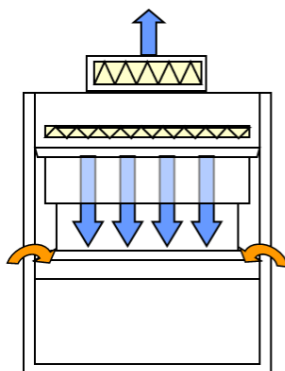


### The Basics of Laboratory Ventilation

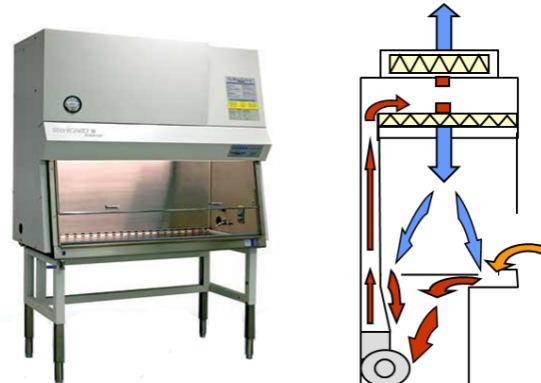
To protect yourself effectively against airborne contaminants such as volatile organic compounds (VOCs), it is essential for you to understand the basics of laboratory ventilation.

[Download Tipsheet \(PDF\)](#)

Front View



Side View



### Laboratory Ventilation Terms & Definitions

As a laboratory worker, knowing laboratory ventilation terms & understanding the role of mechanical, electrical, & electronic control systems will enable you to recognize the limitations of the ventilation system, spot operational issues, & provide valuable feedback critical for system maintenance. [Download Tipsheet \(PDF\)](#)



### Recommendations for Sharing, Cleaning, & Disinfecting Chemical Splash Goggles & Glasses

The Emerging Issues Subcommittee of the ACS Committee on Chemical Safety (CCS) was tasked to recommend safe practices for sharing, cleaning, and disinfecting chemical splash goggles and glasses. [Download Guide \(PDF\)](#)

[View more publications and resources from the ACS Committee on Chemical Safety](#)



# When Online Content Disappears: Link Rot and Digital Decay on Government, News, and Other Webpages

The article is an excerpt reprinted from: Chapekis, A.; Bestvater, S.; Remy, E.; Rivero, G. *When Online Content Disappears*. Pew Research Report, May 17, 2024. <https://www.pewresearch.org/data-labs/2024/05/17/when-online-content-disappears/> (*Report PDF*)

“The internet is an unimaginably vast repository of modern life, with billions of indexed

webpages. But even as users across the world rely on the web to access books, images, news articles and other resources, this content sometimes disappears from view.

A new Pew Research Center analysis shows just how fleeting online content actually is:

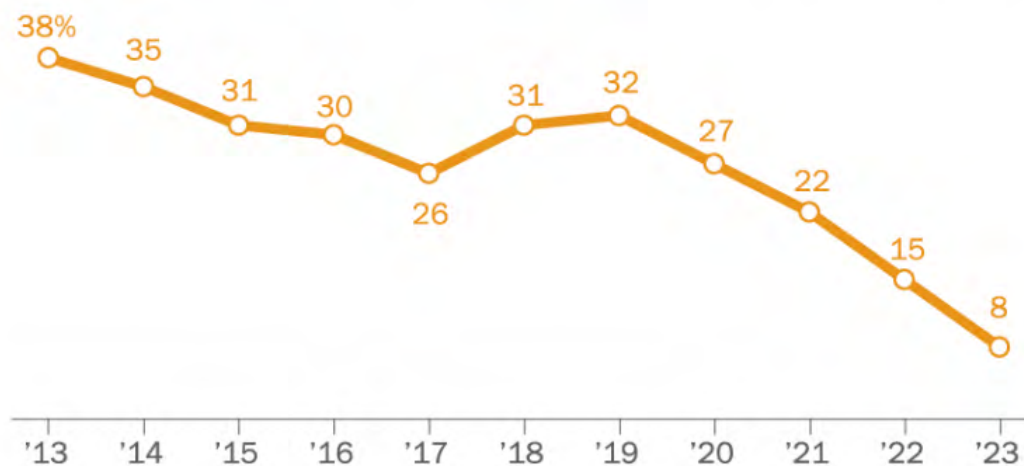
- **A quarter of all webpages that existed at one point between 2013 and 2023 are no**

**longer accessible**, as of October 2023. In most cases, this is because an individual page was deleted or removed on an otherwise functional website.

- **For older content, this trend is even starker.** Some 38% of webpages that existed in 2013 are not available today, compared with 8% of pages that existed in 2023.

## 38% of webpages from 2013 are no longer accessible

*% of links from each year that are no longer accessible as of October 2023*



Source: Pew Research Center analysis of a random selection of URLs collected by the Common Crawl web repository (n=999,989) and checked using page and DNS response codes. Web pages defined as inaccessible if they returned a status code of 204, 400, 404, 410, 500, 501, 502, 503, 523 or did not return a valid status code.

“When Online Content Disappears”

### PEW RESEARCH CENTER

This “digital decay” occurs in many different online spaces. We examined the links that appear on government and news websites, as well as in the “References” section of Wikipedia pages as of spring 2023. This analysis found that:

- **23% of news webpages contain at least one broken link, as do 21% of webpages from government sites.** News sites with a high level of site traffic and those with less are about equally likely to contain broken links. Local-level government webpages (those belonging to city governments) are especially likely to

have broken links.

- **54% of Wikipedia pages contain at least one link in their “References” section that points to a page that no longer exists.**

To see how digital decay plays out on social media, we also collected a real-time sample of tweets during spring 2023 on the social media platform X (then known as Twitter) and followed them for three months. We found that:

- **Nearly one-in-five tweets are no longer publicly visible on the site just months after being posted.** In 60% of these cases, the account that

originally posted the tweet was made private, suspended or deleted entirely. In the other 40%, the account holder deleted the individual tweet, but the account itself still existed.

- **Certain types of tweets tend to go away more often than others.** More than 40% of tweets written in Turkish or Arabic are no longer visible on the site within three months of being posted. And tweets from accounts with the default profile settings are especially likely to disappear from public view.”

*Visit the website and read the full report.*

## ACS celebrates development of Crest toothpaste with Historic Chemical Landmark designation

“Until the mid-20th century, toothpastes were little more than pleasant-smelling abrasives. But in 1955, the introduction of Crest toothpaste brought fluoride chemistry to the fight against tooth decay, launching a new era in dental care. The American Chemical Society honored the *development of Crest* with the National Historic Chemical Landmark designation during a ceremony at Procter & Gamble (P&G) in Cincinnati, Ohio, on April 3. And it will hold another ceremony to honor Crest at Indiana University in Bloomington on April 4.” [Read the full news release.](#)



In 1952, dentist and Indiana University chemistry professor Joseph Muhler presents toothpaste and toothbrushes to two of the thousands of young volunteers who took part in tests of Crest stannous fluoride toothpaste. *Credit: Indiana University Archives*

## Using chemistry and a 300-year-old technique to reinvent the best espresso martini

*A Reactions Science Video: Uncover the Chemistry in Everyday Life*



[Watch video on YouTube](#)  
[View sources for more information](#)

“Adding milk to an alcoholic drink and then curdling that milk is a 300-year-old preservation technique that was used by none other than Ben Franklin. Join George as he discovers the chemistry that makes this technique so useful and learn how to make the best espresso martini you’ll ever taste.”

## New ACS Middle School Chemistry Website



Middle School Chemistry

Lesson Plans ▾

Simulations & Videos

Online Assignments

Tools ▾

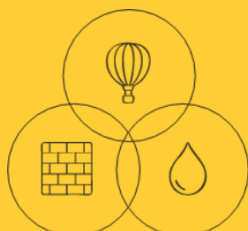
Search 🔍

Middle School Chemistry Lesson Plans

### Big Ideas about the very small

CHAPTER 1

**Matter—Solids, Liquids, and Gases**



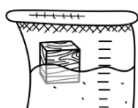
CHAPTER 2

**Changes of State**



CHAPTER 3

**Density**



CHAPTER 4

**The Periodic Table & Bonding**



CHAPTER 5

**The Water Molecule and Dissolving**



CHAPTER 6

**Chemical Change**



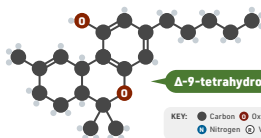
[Explore All Lesson Plans >](#)

<https://www.acs.org/middleschoolchemistry.html>

# Cannabis and synthetic cannabinoids



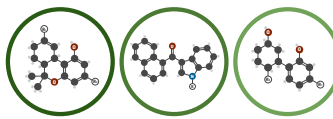
## Cannabis and cannabinoids



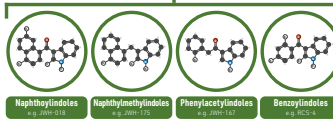
Cannabis contains a large number of different cannabinoid chemicals. The main psychoactive constituent in cannabis is the cannabinoid tetrahydrocannabinol (THC). It acts on cannabinoid receptors in the brain, causing a range of psychological effects.



## Selected classes of synthetic cannabinoids



**Classical** (Structure similar to THC)  
**Aminoalkylindoles** (number of subcategories)  
**Non-classical** (e.g. cyclohexylphenols)



**Naphthylindoles** (e.g. AM-251)  
**Naphthylalkylindoles** (e.g. AM-2251)  
**Phenylacetylindoles** (e.g. AM-2201)  
**Benzylindoles** (e.g. RCS-4)

Synthetic cannabinoids can be classified in a number of ways. Broadly, they can be split into three groups: classical cannabinoids, structurally related to THC; aminoalkylindoles, the most numerous, which can be further split into a number of subclasses; and non-classical, including cyclohexylphenols and other compounds. Other classifications split them into further groups. A group not shown here is the eicosanoids.

A number of the compounds have 'code names'. JWH stands for John W. Huffman, who synthesised many new cannabinoids. Others have more obscure origins: AKB-48 is named after a Japanese girl band and XLR-11 is named after the first liquid rocket fuel developed in the US.

## Synthetic cannabinoids and their effects



### SYNTHESIS

First synthesised in labs in the 1980s for research purposes.



### ILLICIT USE IN 'SPICE'

Sprayed onto dried herbs then smoked or ingested.



### 2-100x

Synthetic cannabinoids can be much more potent than THC.



### SERIOUS SIDE EFFECTS

Adverse effects often much more severe than for THC.

Synthetic cannabinoids (SCs) were never intended for human consumption, but synthesised to investigate potential medicinal uses of cannabis. They target the same receptors, but have a higher efficacy than THC. There is no published safety data for the compounds, and little is known about their effects in humans. Many are controlled substances, but modifications of the compounds produces new entities not covered by legislation. Use of SCs is linked with nausea & vomiting, anxiety, psychosis, seizures, acute renal failure, and in cases, death.

www.compoundchem.com

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