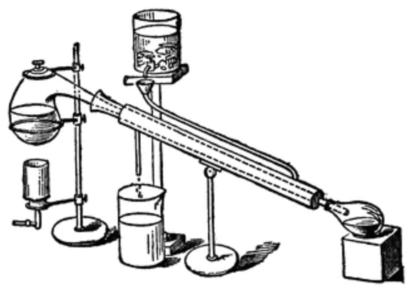
SOUTHWEST RETORT



SEVENTY-SECOND YEAR **October 2019**

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and Chemistry in this area

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Editorial and Business Offices: ***Contact the Editor for subscription and advertisement information.***
Editor: Connie Hendrickson: retort@acsdfw.org

Copy and Layout Editor: Lance Hughes: hugla64@gmail.com

Business Manager: Martha Gilchrist: Martha.Gilchrist@tccd.edu

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Southwest RETORT

Contact the DFW Section

General: info@acsdfw.org

Education: ncw@acsdfw.org
Elections: candidates@acsdfw.org
Facebook: DFWACS
Twitter: acsdfw

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FIFTY YEARS AGO IN *THE SOUTHWEST RETORT*

Compiled by E. Thomas Strom

The ACS Tour speakers for this month are Dr. Douglas C. Neckers of Hope College and Dr. F. O. Rice. Dr. Neckers will be giving talks either on "Additions to Heteroaromatic Molecules" or "Reactions of Aryl Pinacols." Dr. Rice's topic is "Astrochemistry: The Long Distance Science."

The ACS Southwest Regional Meeting will be held at the Mayo Hotel in Tulsa Dec. 4-6. The Fourth Southern Regional Two-Year College Chemistry Conference will be held on Friday and Saturday in connection with the regional meeting. The featured speaker for the Friday evening banquet will be Nobel Laureate Prof. Melvin Calvin from the Laboratory of Chemical Biodynamics at the University of California at Berkeley. The General Chairman for the meeting is Hugh T. Harrison of Dowell in Tulsa, while the Program Chairman is Sam J. Martinez of the University of Tulsa.

The South Texas Section of the American Institute of Chemical Engineers will hold its 24th Annual Technical Meeting and Exposition in Houston on Oct. 23-24.

At Texas Instruments Dr. Gordon K. Teal, Vice President and Chief Scientist for Corporate Development, has won the ACS Award for Creative Invention. He is well known for his work on the chemistry of germanium and silicon semiconductors. Dr. Teal was recently awarded an honorary doctor of science degree from Brown University.

At North Texas State University Dr. C. Gordon Skinner assumed duties as acting chairman of the chemistry department. UNT faculty attending the ACS National Meeting in New York were W. T. Brady, Paul Jones, Jim Marshall, R. B. Escue, and J. L. Carrico. The winner of the Dallas Society of Analytical Chemists Analyst of the Year Award is Dr. Morton Mason of the Dallas City-County Crime Lab. At the Mobil Field Research Laboratory Dr. James C. Melrose gave an invited lecture titled "Thermodynamics of Solid/Liquid Interfacial Regions" at the 22 nd IUPAC Congress held in Sidney, Australia Aug. 20-27. He also visited laboratories in Canberra and Melbourne and in Yokohama, Japan.

At UT-Austin Dr. James E. Boggs attended a conference held in Dijon, France, July 1-4. While in Europe Dr. Boggs also gave lectures at the University of Ulm, University of Freiburg, Swiss Federal Institute of Technology, National Academy of Sciences in Budapest, University of Kiel, University of Oslo, and the University of Utrecht. Boggs also recently received an NSF grant to study "Collision Broadening of Rotational Spectral Lines."

At Baylor University Dr. W. O. Milligan will be the first recipient of the Honor Scroll Award of the Southwest Chapter of the American Institute of Chemists. Dr. John S. Belew presented a seminar at the University of Manchester.

From the ACS Press Room

Cleaning with Bleach Could Create Indoor Air Pollutants

"Indoor Illumination of Terpenes and Bleach Emissions Leads to Particle Formation and Growth"

Environmental Science & Technology

For generations, people have used chlorine bleach to clean and disinfect their homes.

However, researchers have now discovered that bleach fumes, in combination with light and a citrus compound found in many household products, can form airborne particles that might be harmful when inhaled bypets or people. They report their results in ACS' *Environmental Science & Technology*.

Bleach cleaning products emit chlorine-containing compounds, such as hypochlorous acid (HOCl) and chlorine gas (Cl2), that can accumulate to relatively high levels in poorly ventilated indoor environments. These gases can react with other chemicals commonly found in homes, such as limonene — an orange-or lemon-scented compound added to many personal care products, cleaners and air fresheners. In addition, indoor lighting or sunshine through windows might split HOCl and Cl2 into a hydroxyl radical and a chlorine atom, which can react with other compounds to form air particles called secondary organic aerosols (SOAs). These pollutants have been linked to respiratory problems and other adverse health effects. Chen Wang and colleagues wanted to see whether limonene and bleach fumes, at concentrations likely to occur in indoor environments, could react to produce SOAs under light and dark conditions.

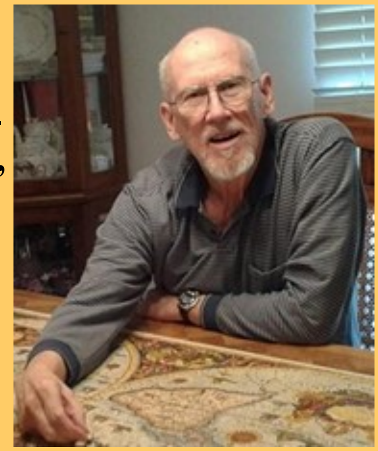
The researchers added limonene, HOCl and Cl2 to air in an environmental chamber and then measured the reaction products using mass spectrometry. In the dark, limonene and HOCl/Cl2 quickly reacted to produce a variety of volatile compounds. When the team turned on fluorescent lights or exposed the chamber to sunlight, these volatile compounds interacted with the light -generated hydroxyl radicals and chlorine atoms to form SOAs. Although the composition and possible health effects of these particles need to be studied further, they could be occupational hazards for people involved in cleaning activities, the researchers say.

The authors acknowledge funding from the Chemistry of Indoor Environments program of the Alfred P. Sloan Foundation.

ACS Local Section
Dallas-Fort Worth

Mark Your Calendars for These Two Great Events

Sunday, October 27, 2019 2p-5p



Join ASCDFW for a reception honoring Dr. Robert G. Landolt, 2019 Chemistry Ambassador, & the Recognition of 50-, 60- and 70- year ACS members.

at the

Center For Transforming Lives

Fort Worth , Texas

Click link to register:

https://www.eventbrite.com/e/2019-ambassador-award-recognition-of-50-60-70-year-acs-members-tickets-75871871811

Thursday November 7, 2019 6p - 9p

Wilfred T. Doherty Award Dinner

Honoring 2019 Recipient

Professor Julia Chan

Department of Chemistry & Biochemistry

The University of Texas at Dallas

The event will be held in the McDermott Suite at UTD

and will feature Dr Chan's Award Talk:

"Adventures in the Discovery and Crystal Growth of Quantum Materials"

as well as Presentation of the 2017, 2018, and 2019 Doherty portraits to the UTD Doherty Gallery

Click Link to register:

https://www.eventbrite.com/e/2019-doherty-award-dinner-honoring-dr-julia-chan-of-utd-tickets-76329731281

Climate Change Presentations for Fall/Winter 2019-2020

Three categories of talks as described below are now availabile. All are aimed and appropriate for general audiences.

- ***Shining a Light (not a pun) on Climate Change, for Children!***
- ***Interactive WEB based Activity for Climate Change Decision Making!***
- ***Climate Change Story Telling with 'Touches of Humor!***

E-Mail responses of interest are MOST CONVENIENT!

R. G. (Bob) Landolt
Emeritus Professor of Chemistry
Texas Wesleyan Universtiy
rlandolt@txwes.edu

From the ACS Press Room

Plastic Teabags Release Microscopic Particles into Tea

"Plastic Teabags Release Billions of Microparticles and Nanoparticles into Tea"

Environmental Science & Technology

Many people are trying to reduce their plastic use, but some tea manufacturers are moving in the opposite direction: replacing traditional paper teabags with plastic ones. Now, researchers reporting in ACS' *Environmental Science & Technology* have discovered that a soothing cup of brewed beverage may come with a dose of micro- and nano-sized plastics shed from the bags. Possible health effects of ingesting these particles are currently unknown, the researchers say.

Over time, plastic breaks down into tiny microplastics and even smaller nanoplastics, the latter being less than 100 nanometers (nm) in size. (For comparison, a human hair has a diameter of about 75,000 nm.) Scientists have detected the microscopic particles in the environment, aquatic organisms and the food supply, but they don't know yet whether they are harmful to humans. Nathalie Tufenkji and colleagues wondered whether recently introduced plastic teabags could be releasing micro- and nanoplastics into the beverage during brewing. They also wanted to explore effects of the released particles on small aquatic organisms called Daphnia magna, or water fleas, which are model organisms often used in environmental studies.

To conduct their analysis, the researchers purchased four different commercial teas packaged in plastic teabags. The researchers cut open the bags, removed the tea leaves and washed the empty bags. Then, they heated the teabags in containers of water to simulate brewing conditions. Using electron microscopy, the team found that a single plastic teabag at brewing temperature released about 11.6 billion microplastic and 3.1 billion nanoplastic particles into the water. These levels were thousands of times higher than those reported previously in other foods. In another experiment, the researchers treated water fleas with various doses of the micro- and nanoplastics from teabags. Although the animals survived, they did show some anatomical and behavioral abnormalities. More research is needed to determine if the plastics could have more subtle or chronic effects on humans, the researchers say.

The authors acknowledge funding from the Canada Research Chairs Program, the Canada Foundation for Innovation, the Natural Sciences and Engineering Research Council of Canada and McGill University.

From the ACS Press Room

Why Some Greens Turn Brown in Historical Paintings

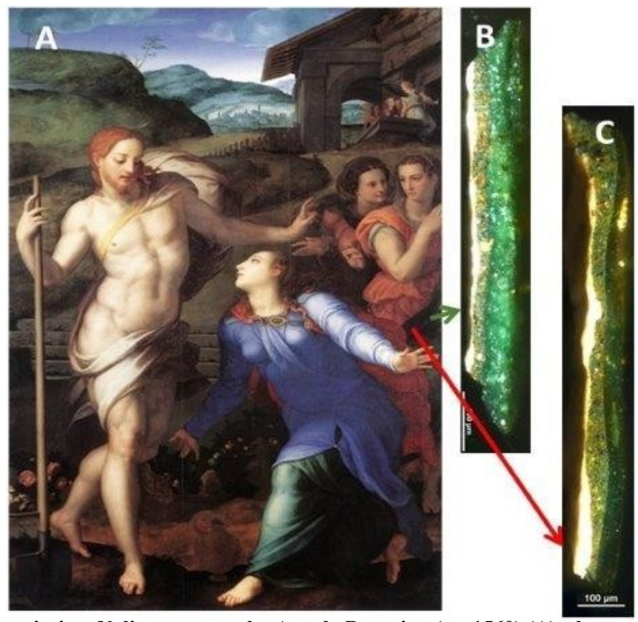
"Photochemical Origin of the Darkening of Copper Acetate and Resinate Pigments in Historical Paintings"

Inorganic Chemistry

Enticed by the brilliant green hues of copper acetate and copper resinate, some painters in the Renaissance period incorporated these pigments into their masterpieces. However, by the 18th century, most artists had abandoned the colors because of their tendency to darken with time. Now, researchers reporting in ACS' journal *Inorganic Chemistry* have uncovered the chemistry behind the copper pigments' color change.

Copper acetate (also known as verdigris) and copper resinate were used in European easel paintings between the 15th and 17th centuries. Artists typically mixed these pigments with linseed oil to make paint. Until now, scientists didn't know why the green paints often turned brown with time. Light exposure was thought to play a role because areas of paintings protected by frames remained green. Also, oxygen appeared to contribute to the darkening process, with the brown color spreading from cracks in the paint that exposed the underlying copper pigments to air. So Didier Gourier and colleagues wanted to analyze the chemical changes that occur in the paints upon light exposure.

The team determined that the molecular structures of copper acetate and copper resinate were quite similar: Both had two copper atoms bridged by four carboxylate groups, but there was more space between resinate than acetate molecules. The researchers mixed the pigments with linseed oil and spread them in a thin layer. They then exposed the paint films to 16 hours of 320-mW LED light, which corresponded to hundreds of years of museum light. This illumination caused bridging molecules between the pair of copper atoms to be lost, which were then replaced by an oxygen molecule, creating bimetallic copper molecules responsible for the brown color. This process occurred more readily for copper resinate than for copper acetate. Boiling the linseed oil before mixing, which some artists did to improve the drying process, slowed the darkening reaction.



A painting, Noli me tangere by Angolo Bronzino (ca. 1560) (A), shows darkening of green copper pigment in a light-exposed area (C) but not in an area protected by the frame (B).

The authors acknowledge funding from the French Foundation for Cultural Heritage Sciences and LabEx Patrima.

From the ACS Press Room

Mosquito Eye Inspires Artificial Compound Lens (video)

"Multifunctional Liquid Marble Compound Lenses"

ACS Applied Materials & Interfaces

Anyone who's tried to swat a pesky mosquito knows how quickly the insects can evade a hand or fly swatter. The pests' compound eyes, which provide a wide field of view, are largely responsible for these lightning-fast actions. Now, researchers reporting in ACS *Applied Materials & Interfaces* have developed compound lenses inspired by the mosquito eye that could someday find applications in autonomous vehicles, robots or medical devices. Watch a video of the lenses here.

Youtube ID: -hh-rOTXJFc

Compound eyes, found in most arthropods, consist of many microscopic lenses organized on a curved array. Each tiny lens captures an individual image, and the mosquito's brain integrates all of the images to achieve peripheral vision without head or eye movement. The simplicity and multifunctionality of compound eyes make them good candidates for miniaturized vision systems, which could be used by drones or robots to rapidly image their surroundings. Joelle Frechette and colleagues wanted to develop a liquid manufacturing process to make compound lenses with most of the features of the mosquito eye.

To make each microlens, the researchers used a capillary microfluidic device to produce oil droplets surrounded by silica nanoparticles. Then, they organized many of these microlenses into a closely packed array around a larger oil droplet. They polymerized the structure with ultraviolet light to yield a compound lens with a viewing angle of 149 degrees, similar to that of the mosquito eye. The silica nanoparticles coating each microlens had antifogging properties, reminiscent of nanostructures on mosquito eyes that allow the insect organs to function in humid environments. The researchers could move, deform and relocate the fluid lenses, allowing them to create arrays of compound lenses with even greater viewing capabilities.

The authors acknowledge funding from the Department of Energy, the National Science Foundation and the National Science Foundation Graduate Research Fellowship Program.

From the ACS Press Room

Engineered Protein Crystals Make Cells Magnetic

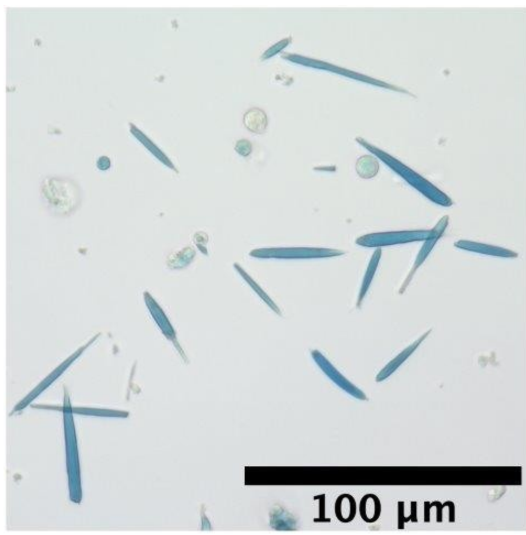
"Engineering a Genetically Encoded Magnetic Protein Crystal"

Nano Letters

If scientists could give living cells magnetic properties, they could perhaps manipulate cellular activities with external magnetic fields. But previous attempts to magnetize cells by producing iron-containing proteins inside them have resulted in only weak magnetic forces. Now, researchers reporting in ACS' *Nano Letters* have engineered genetically encoded protein crystals that can generate magnetic forces many times stronger than those already reported.

The new area of magnetogenetics seeks to use genetically encoded proteins that are sensitive to magnetic fields to study and manipulate cells. Many previous approaches have featured a natural iron-storage protein called ferritin, which can self-assemble into a "cage" that holds as many as 4,500 iron atoms. But even with this large iron-storage capacity, ferritin cages in cells generate magnetic forces that are millions of times too small for practical applications. To drastically increase the amount of iron that a protein assembly can store, Bianxiao Cui and colleagues wanted to combine the iron-binding ability of ferritin with the self-assembly properties of another protein, called Inkabox-PAK4cat, that can form huge, spindle-shaped crystals inside cells. The researchers wondered if they could line the hollow interiors of the crystals with ferritin proteins to store larger amounts of iron that would generate substantial magnetic forces.

To make the new crystals, the researchers fused genes encoding ferritin and Inkabox-PAK4cat and expressed the new protein in human cells in a petri dish. The resulting crystals, which grew to about 45 microns in length (or about half the diameter of a human hair) after 3 days, did not affect cell survival. The researchers then broke open the cells, isolated the crystals and added iron, which enabled them to pull the crystals around with external magnets. Each crystal contained about five billion iron atoms and generated magnetic forces that were nine orders of magnitude stronger than single ferritin cages. By introducing crystals that were pre-loaded with iron to living cells, the researchers could move the cells around with a magnet. However, they were unable to magnetize the cells by adding iron to crystals already growing in cells, possibly because the iron levels in cells were too low. This is an area that requires further investigation, the researchers say.



These magnetic protein crystals, isolated from cells, were stained with a blue dye that binds to iron.

Credit: Adapted from Nano Letters 2019, DOI: 10.1021/acs.nanolett.9b02266

The authors acknowledge funding from the Stanford Interdisciplinary Graduate Fellowship, the Wu Tsai Neurosciences Institute, the David & Lucile Packard Foundation and the National Institutes of Health.

MARVELOUS METALS

CHEMISTRY CONNECTIONS 2019

TUESDAY, OCTOBER 22 - SATURDAY, OCTOBER 26

Did you know that 76% of periodic table elements are metals? Conduct interesting investigations and fascinating experiments with these glistening and gleaming elements during Chemistry Connections 2019. Museum staff, American Chemical Society Student Groups from area universities and high school students will lead engaging hands-on explorations with these marvelous metals along with classic chemistry experiments.

CHEMISTRY CONNECTIONS HOURS

OCTOBER 22-25
10:00 AM-2:00 PM

OCTOBER 26
10:00 AM-4:00 PM

School Field Trips

All Chemistry Connections experiences are included with exhibit admission and are designed for 2nd grade and above. School groups of 15 or more can book field trips in advance by calling 817-255-9440 or visiting www.fwmuseum.org/about-us/school-field-trips/

HOMESCHOOL AFTERNOON

(2ND GRADE AND ABOVE)

Special extended Chemistry Connections hours for homeschool educators and children will be offered on Thursday, October 24 from 1:30 - 4:00 PM. Explore the fascinating properties of metals, try out classic chemistry experiments and learn from area high school and university students.

FWMUSEUM.ORG/EXHIBIT/CHEMISTRY-CONNECTIONS/

FORT WORTH MUSEUM
SCIENCE AND HISTORY

Chemistry Connections is sponsored locally by

Alcon FOUNDATION

From the ACS Press Room

Smoothing Wrinkles in Mice — Without Needles

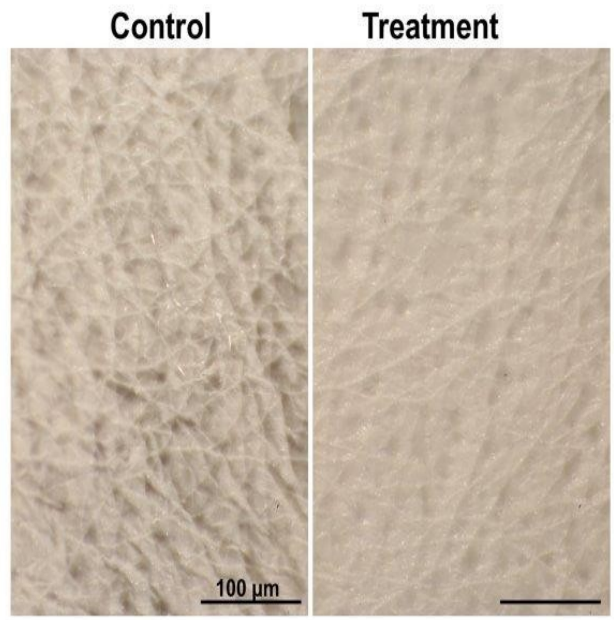
"Needle-Free Injection of Exosomes Derived from Human Dermal Fibroblast Spheroids Ameliorates Skin Photoaging"

ACS Nano

In the quest for a more youthful appearance, many people slather ointments on their skin or undergo injections of dermal fillers. But topical treatments often aren't very effective because they don't penetrate deep within the skin, whereas the results from injections typically last for only a few months and can be painful. Now, researchers reporting in ACS Nano have developed a needle-free "exosome" treatment that reduces wrinkles in UV-exposed mice.

As skin cells age, they lose their ability to multiply and to produce collagen, which is the main structural protein in skin. Recently, scientists discovered that treating human skin cells in a dish with exosomes from stem cells boosted the amount of collagen and caused other youthful changes. Exosomes are membranous vesicles containing protein and RNA that cells release to communicate with each other. Ke Cheng and colleagues wondered if treating mouse skin with exosomes from human dermal fibroblasts could reduce wrinkles and restore youthful characteristics. To avoid having to inject the exosomes, the researchers tested a needle-free device that uses a jet of air to deliver medications deep into the skin.

The researchers exposed mice to ultraviolet B (UVB) light, which accelerates aging and causes wrinkles to form. After 8 weeks of UVB exposure, the researchers administered exosomes from human dermal fibroblasts to some of the mice with the needle-free injector. Three weeks later, the treated mice showed significantly thinner and more superficial wrinkles than untreated mice or those that received topical retinoic acid, a standard anti-aging medication. Skin from the exosome-treated mice was thicker and showed reduced inflammation and enhanced collagen synthesis compared with skin from untreated mice.



Skin from mice treated with exosomes (right) had shallower wrinkles after UV exposure than untreated mice (left). Scale bar, 100 µm.

Credit: Adapted from ACS Nano 2019, DOI: 10.1021/acsnano.9b0438

The authors acknowledge funding from the National Institutes of Health and the American Heart Association.

Tuesday, October 22, 2019 at 6:45pm ET

Join thousands of students and early career chemists from around the world for this FREE, one-night only event during National Chemistry Week. Discover how chemists are developing new technologies using metals at the intersection of organic and inorganic chemistry. From innovations in medical imaging and theranostics to fundamental changes to the way we create everyday necessities like clothing, food, and energy, these scientists will demonstrate how we can harness the power of our "marvelous metals."

ACS-affiliated groups: Register and confirm your shipping address by October 4th, 2019 (Sept. 27th for US Territories and International groups) to receive your physical box.

What to Expect from Your Event

- A live interactive video broadcast featuring presentations and Q&A with experts in organometallic chemistry
- Professor Vy Maria Dong will discuss the importance of organic chemistry processes to the industries that power modern society and how she is using metals to create improved reagents, catalysts, and strategies for a more sustainable and greener future
- Professor Thomas J. Meade will define molecular imaging, what it can currently do in

the clinic, and how his “bioactivated” or “conditionally activated” probes could revolutionize how we diagnose and even treat patients during the diagnostic phase

- Be the first to answer “Marvelous Metal Trivia” on Twitter with #ACSPIB and get a shout out live on-air!
- Meet thousands of fellow students and professionals around the world on Facebook, Twitter, and Instagram by posting with the event hashtag #ACSPIB
- Unpack raffle prizes, handouts, and other ACS resources to share with your members*
- Take your event further with the ACSPIB “Expansion Pack,” including guides for optional hands-on activities, ice breakers, experiments, and discussion questions
- This event is aimed at college-level chemistry students and early career chemists, but it may be suitable for some high school groups and other communities.
  Email multimedia@acs.org with questions about program content.

*Final Box and Presentation Content Subject to Change.

What is ACS Program-in-a-Box?

ACS Program-in-a-Box is the easiest event you'll ever host because "it's all in the box." With very little effort (acquire the space and gather the crowd), you can host an energetic science event that engages chemistry students and early career chemists.

Physical boxes are an exclusive benefit for active ACS-affiliated groups. This includes, but is not limited to, groups hosted by ACS Local Sections, ACS Technical Divisions, ACS Student Chapters, and ACS members. ACS International Chemical Sciences Chapters and ACS International Student Chapters are also now eligible! If you have any questions about the status of your ACS group and your eligibility to receive a physical box, contact the ACS PIB team at multimedia@acs.org.

Not affiliated with ACS? That’s okay! We want all chemists to join the party and connect with each other. We’ll send you a “digital box” to download handouts included in the physical box for you to print and share with your attendees. We can also help you use ACS Program-in-a-Box™ to start your Student Chapter, or get your Local Section or Student Chapter back into an active status, so next time you’ll see an ACS Program-in-a-Box™ on your doorstep!

ACS Program-in-a-Box™ does not endorse any products or services. The views expressed in this presentation are those of the presenters and do not necessarily reflect the views or policies of the American Chemical Society.

Meet the Experts

Thomas J. Meade
Professor of Chemistry
Northwestern University

Vy M. Dong
Full Professor of Natural Sciences
University of California, Irvine

From the editor

National Chemistry Week started as National Chemistry Day (10/23, of course) but there just wasn't enough time in one day for all the great chemistry activities. The first NCD we had in the DFW Section was at Nolan High School in Arlington. George Hague did his famous boom show, and we had college tables, talks, and refreshments. We didn't have much money, so the snacks were actually donated by my sister-in-law...she ran a distribution center and we got all the expired products that month! The next year was at Irving High School, and we had George again for his show, hands-on activities, and non-expired snacks. And so it went on!

Thanks to the Fort Worth Museum of Science and History for hosting National Chemistry Week, our sponsor Alcon Laboratories, and all of the local colleges and universities.

Best regards,
Connie