

# Bringing chemists and chemistry experiments into your museum and out into your community



Science Museum of Minnesota



# Agenda

- **Catherine McCarthy**, [cmcarthy@smm.org](mailto:cmcarthy@smm.org)  
**Science Museum of Minnesota**, Saint Paul, MN
- **Patti Galvan**, [P\\_Galvan@acs.org](mailto:P_Galvan@acs.org)  
**American Chemical Society**, Washington, DC
- **Emily Belle**, [ebelle@sciencenter.org](mailto:ebelle@sciencenter.org)  
**Sciencenter**, Ithaca, NY
- **Soma Chatterji**, [ChatterjiS@carnegiesciencecenter.org](mailto:ChatterjiS@carnegiesciencecenter.org)  
**Carnegie Science Center**, Pittsburgh, PA
- **Darrell Porcello**, [porcello@gmail.com](mailto:porcello@gmail.com)  
**Children's Creativity Museum**, San Francisco, CA
- **Discussion and Questions**

**Catherine McCarthy**  
**Science Museum of Minnesota**  
**Saint Paul, MN**

# Project Overview

## Explore Science: Let's Do Chemistry



Children's Creativity Museum, San Francisco



**Catherine McCarthy**  
**Science Museum of Minnesota**  
cmccarthy@smm.org  
ASTC 2019



# Project Goals

Putting research into practice

Hands-on activities that increase:

1. Interest,
2. Relevance
3. Self-efficacy

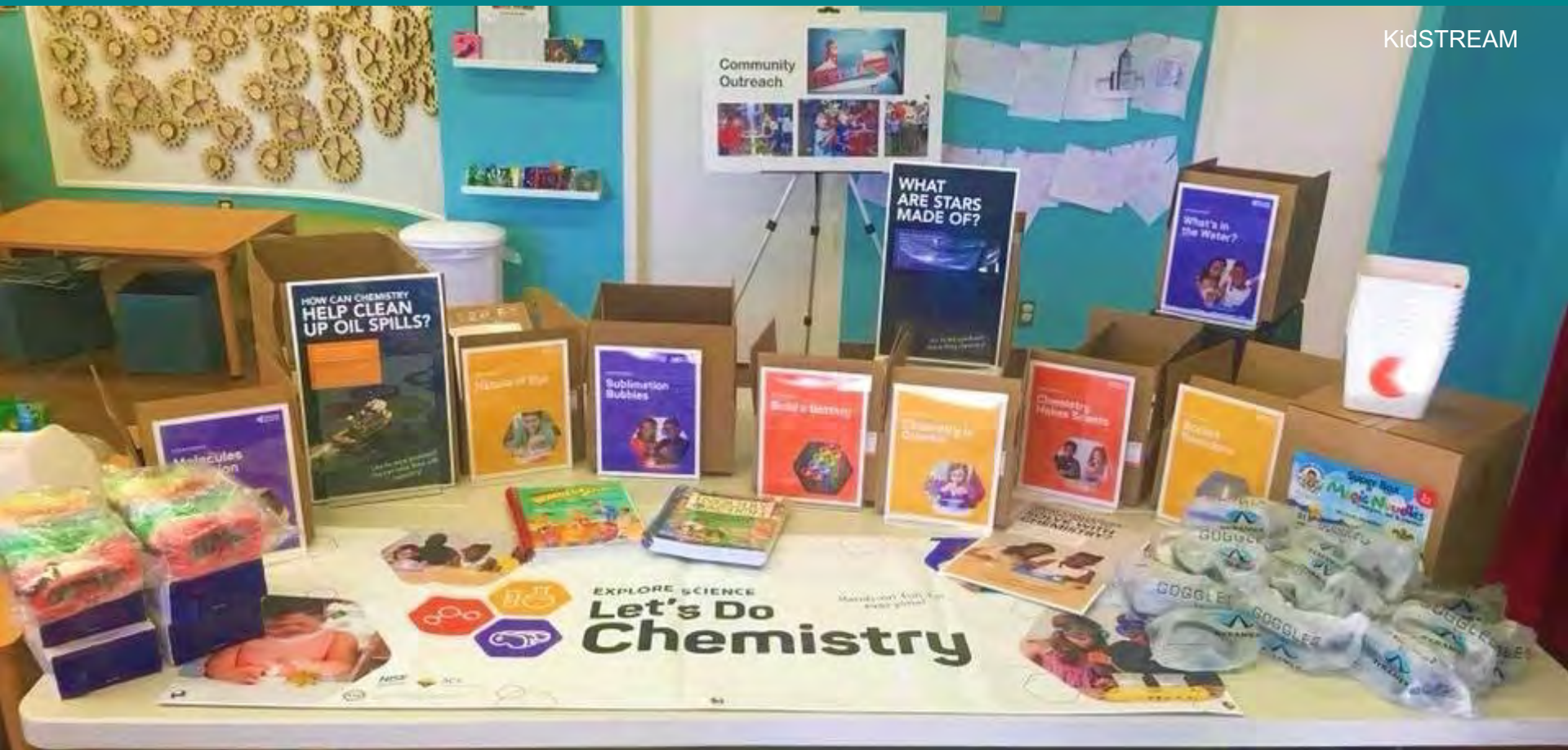


# Explore Science: Let's Do Chemistry kit contents



# Explore Science: Let's Do Chemistry kit contents

KidSTREAM



# Activity Guides

## Activity guides

EXPLORE SCIENCE

LET'S DO CHEMISTRY

# Nature of Dye

**What makes me red?**

**What makes me orange?**

LET'S DO CHEMISTRY

### Nature of Dye

**Prepare & Age**

Place the orange in a clean glass jar and cover it with water. Let the jar sit for 24 hours. Strain the juice into a clean glass jar. Add a few drops of white vinegar to the juice. Let the mixture sit for 24 hours.

**Change the color**

Place a small amount of the orange juice mixture in a clean glass jar. Add a few drops of white vinegar to the mixture. Let the mixture sit for 24 hours.

**Test and experiment**

Use the orange juice mixture to dye fabric. Dip a piece of fabric into the mixture. Let the fabric sit for 24 hours. Wash the fabric with water. Observe the color change.

**Let's keep exploring!** There's a lot more to explore with dyes. Try using different fruits and vegetables to make dyes. Try using different fabrics to see how they react to the dyes.

### How many colors can you make?

**Mortar & Pestle**

**Pipette**

**Petri Dish**

LET'S DO CHEMISTRY

### Nature of Dye

#### Facilitator Guide

**Activity Overview**

This activity is designed to help students understand the nature of dyes and how they can be used to create different colors. It involves preparing a dye solution and using it to dye fabric.

**Learning Objectives**

- Understand the nature of dyes and how they can be used to create different colors.
- Prepare a dye solution and use it to dye fabric.
- Observe the color change and understand the factors that affect it.

**Materials**

- Orange
- White vinegar
- Water
- Clean glass jar
- Strainer
- White fabric
- Pipette
- Petri dish

**Procedure**

- Prepare the orange juice mixture.
- Change the color of the mixture.
- Test and experiment with the mixture.

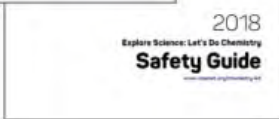
**Assessment**

Observe the color change and understand the factors that affect it. Record the results of the experiment.

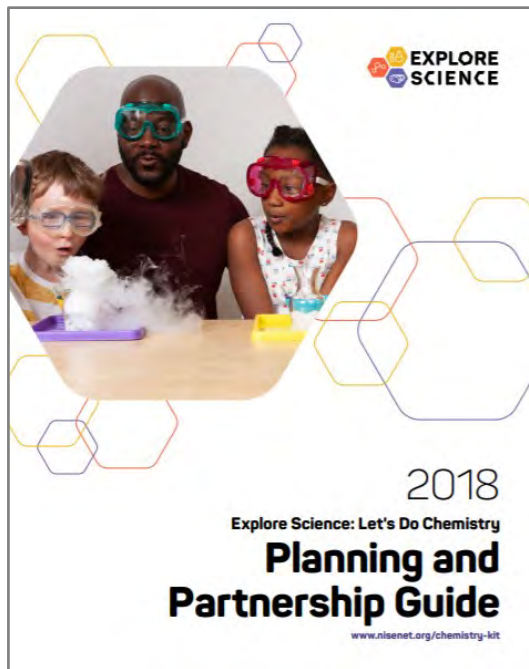


# Training Guides

## Training guides



# Event Planning an Partnerships Guide



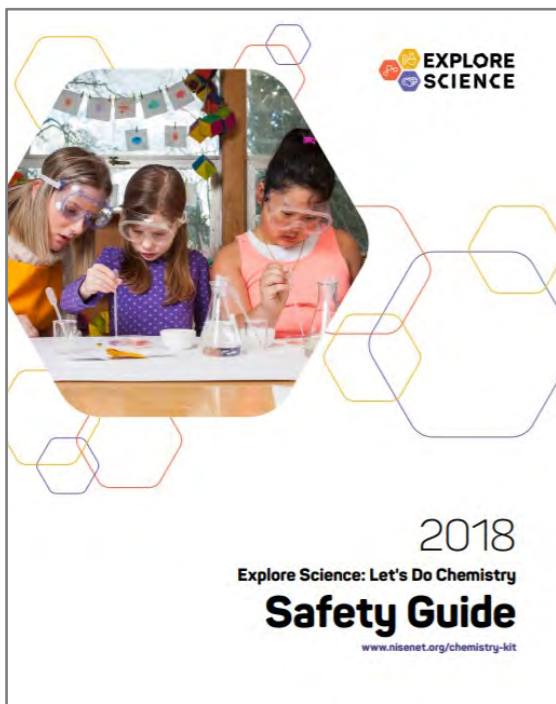
## Event Planning and Partnership Guide

This guide contains everything you will need to begin planning and promoting your Let's Do Chemistry event.

Guide covers

- Planning timeline
- National Chemistry Week
- Collaborations and finding local experts
- Training staff and volunteers
- Additional resources
- Evaluating your event
- Promotional and marketing materials

# Safety Guide



## Safety Guide

Use this guide as you plan your Let's Do Chemistry event and as a resource before training, demonstrating, or facilitating the activities.

Guide covers

- Let's Do Chemistry kit safety practices and protocols
- General chemistry safety guidelines, protocols, and precautions
- Additional safety tips
- Chemistry materials and supplies
- Additional resources

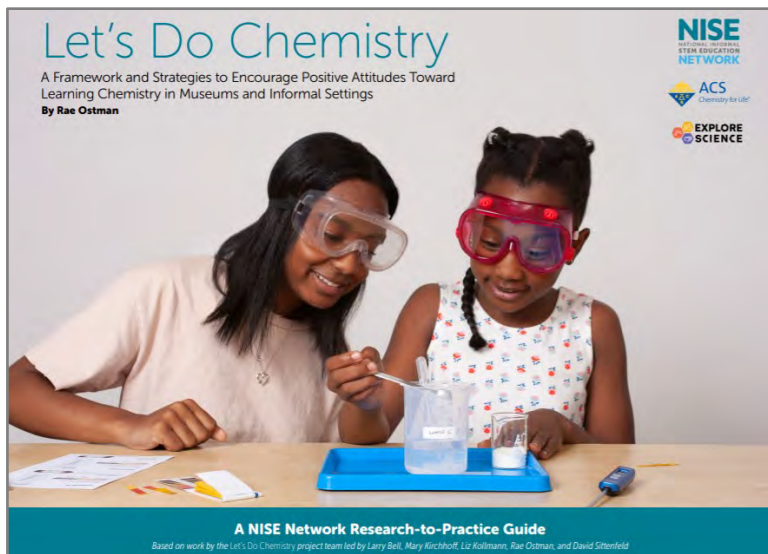
# Framework and Strategies

## Framework and Strategies Research to Practice Guide

This guide will help you and your facilitators run a fun, successful Let's Do Chemistry event and to encourage positive attitudes toward learning chemistry. Within the guide

Guide covers

- Let's Do Chemistry project overview
- Learning chemistry in museums
- Creating the framework
- Understanding the framework
- Using the framework



# Professional Development Videos

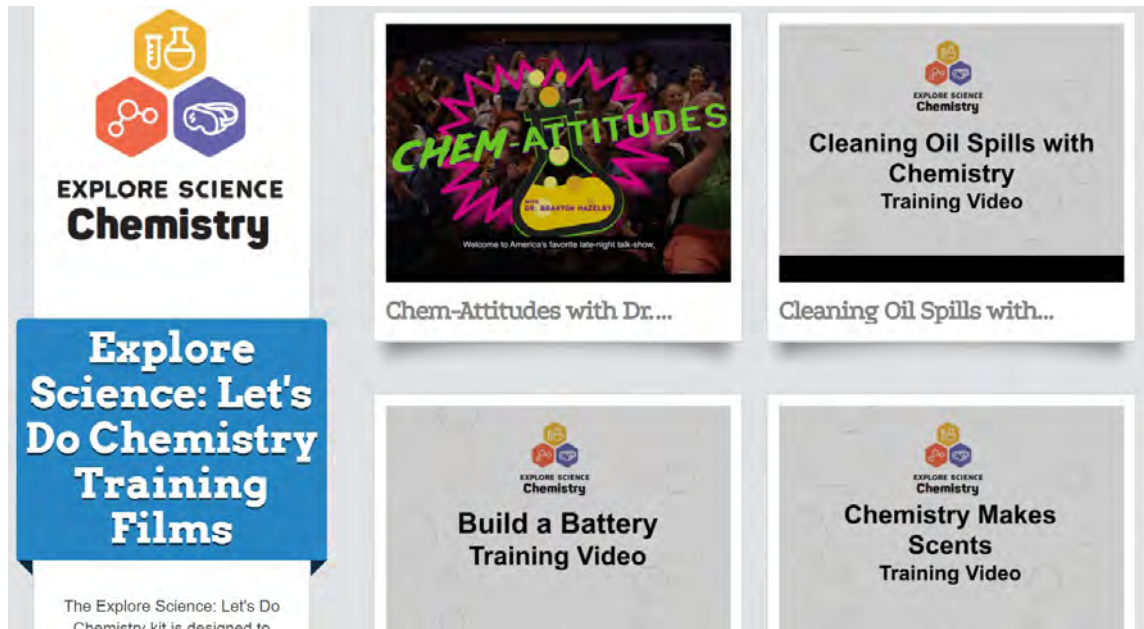
## Training videos

Training videos for each hands-on activity intended for staff and volunteer educators

## Facilitation video

**Chem-Attitudes with Dr. Braxton Hazelby facilitation training video**

This funny video will help you and your facilitators run activities in a way that encourages participation and positive attitudes towards learning about chemistry.



# Digital Materials

## Physical kits

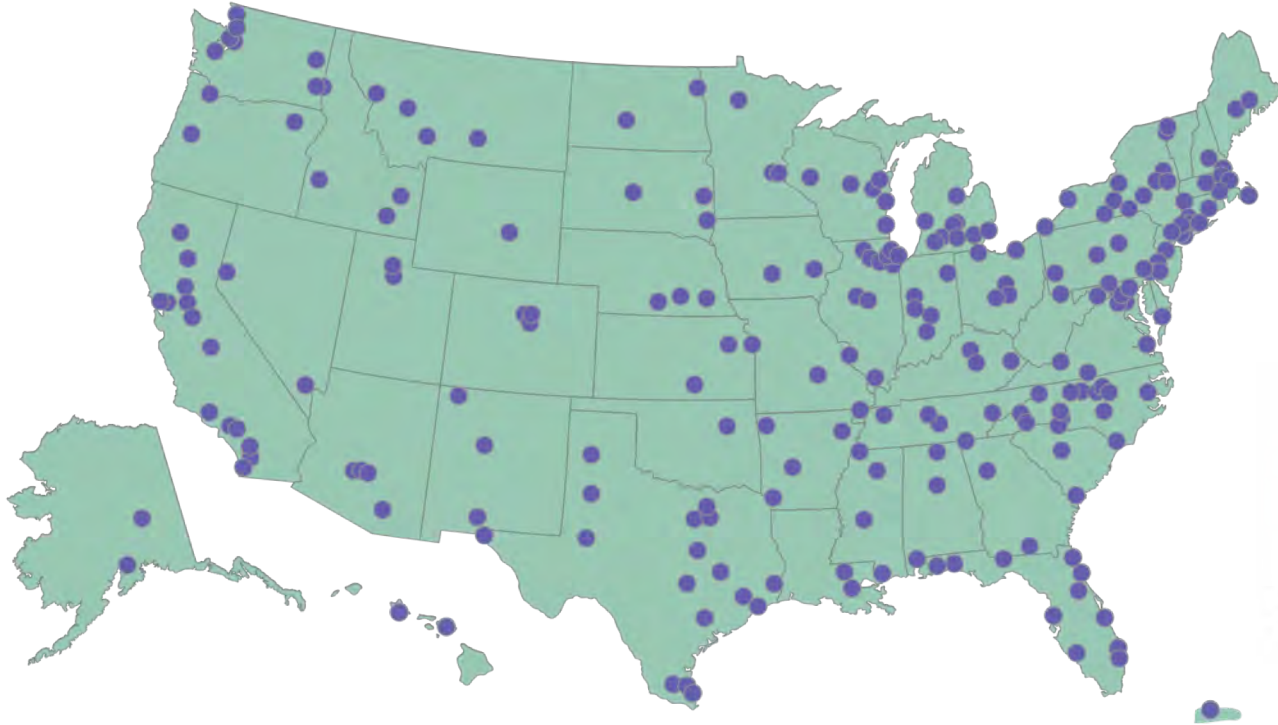
Include USB drive

## Digital Download

[www.nisenet.org/chemistry-kit](http://www.nisenet.org/chemistry-kit)



# Explore Science: Let's Do Chemistry kits



EXPLORE SCIENCE

**Let's Do Chemistry**

250 physical kits distributed across the US  
museums, universities, ACS Local Sections & Student Chapters

# Events across the United States





# Events across the United States



Museum of Science, Boston, MA



Science Museum of Minnesota,  
Saint Paul, MN



EXPLORE SCIENCE  
**Let's Do Chemistry**



# Events across the United States



Children's Discovery Museum, Normal, Illinois



Children's Discovery Museum, Normal, Illinois



Discovery Station, Hagerstown, Maryland



University of Arkansas  
Center for Mathematics  
and Science Education



Fairbanks Children's Museum, Alaska

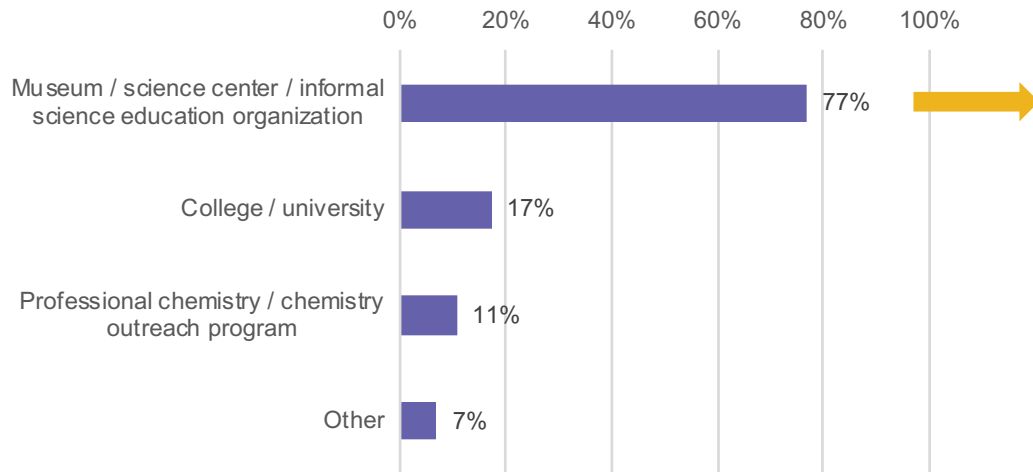


Fairbanks Children's Museum

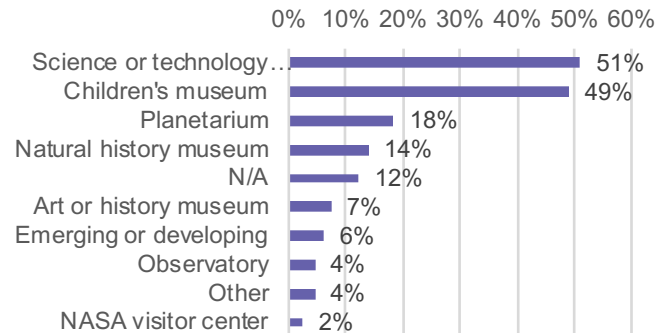
# Who hosted Let's Do Chemistry events?

## Organization type

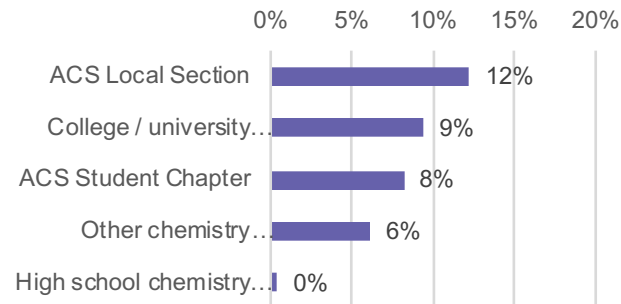
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## Museum type



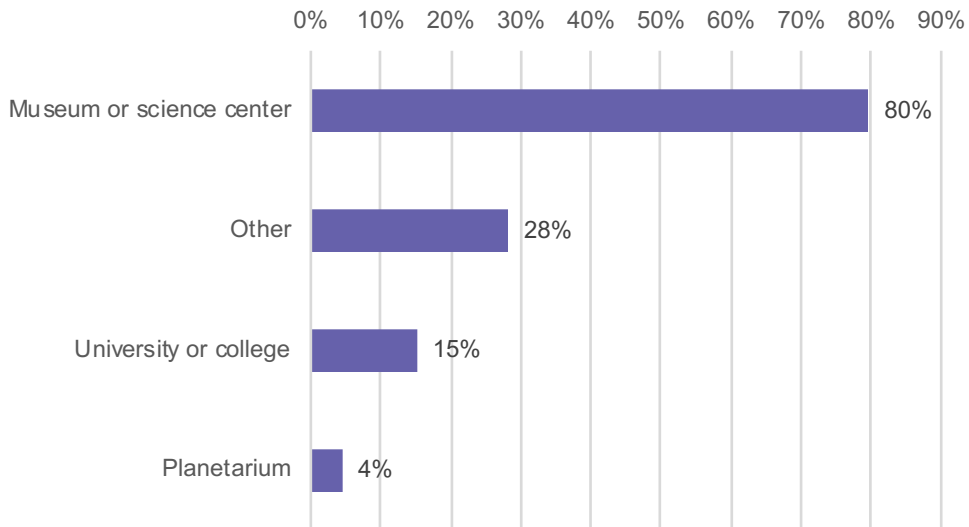
## Chemistry organization



# Where were events hosted?



## Event location



## Other locations included:

- Public library, K-12 schools, school district family science events
- Day camps, afterschool programs, outdoor field classroom
- Boys and Girls Clubs, Scouts
- Church, church camp
- Community organizations, community centers, local street markets, festivals, malls
- Fair grounds
- Hospital clinic
- State park, National laboratory

# Public audiences reached through events

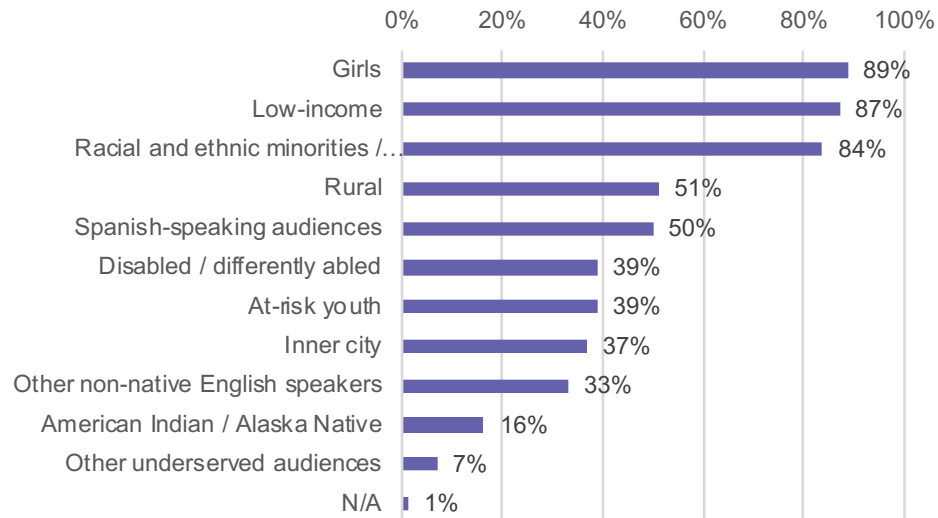


**National Chemistry Week @ACS\_NCW · 23 Oct 2018**

Thanks to @airandspace and our volunteer chemists who taught over 320 people about the importance of #chemistry through 8 engaging hands-on experiments!

#NationalChemistryWeek @AmerChemSociety – at National Air and Space Museum

## Event audiences



# Public audiences reached through events



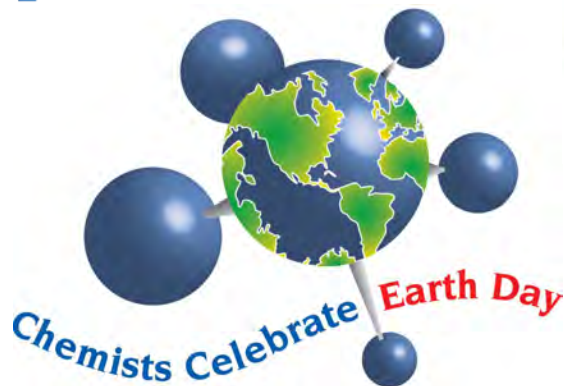
Shared by ECHO, Leahy Center for Lake Champlain, VT



Shared by Discovery Station, Hagerstown, Maryland

- **210,526 people reached** through October-November 2018 Let's Do Chemistry events across the US
- **6,121 volunteers participated** in and facilitated hands-on activities
- Many partners are already been using the materials in other ways following the Fall 2018 events

# More Opportunities for Special Events



[nisenet.org/national-chemistry-week](http://nisenet.org/national-chemistry-week)

# National Chemistry Week and Let's Do Chemistry events

*“The kit provided an easy way for NISE Network partners and ACS groups to make new connections and learn about each other” - David Horwitz, Outreach Programs Manager, ACS*



69% of Explore Science: Let's Do Chemistry kit recipients reported using their activities during National Chemistry Week (October 21<sup>st</sup>-27<sup>th</sup>, 2018)

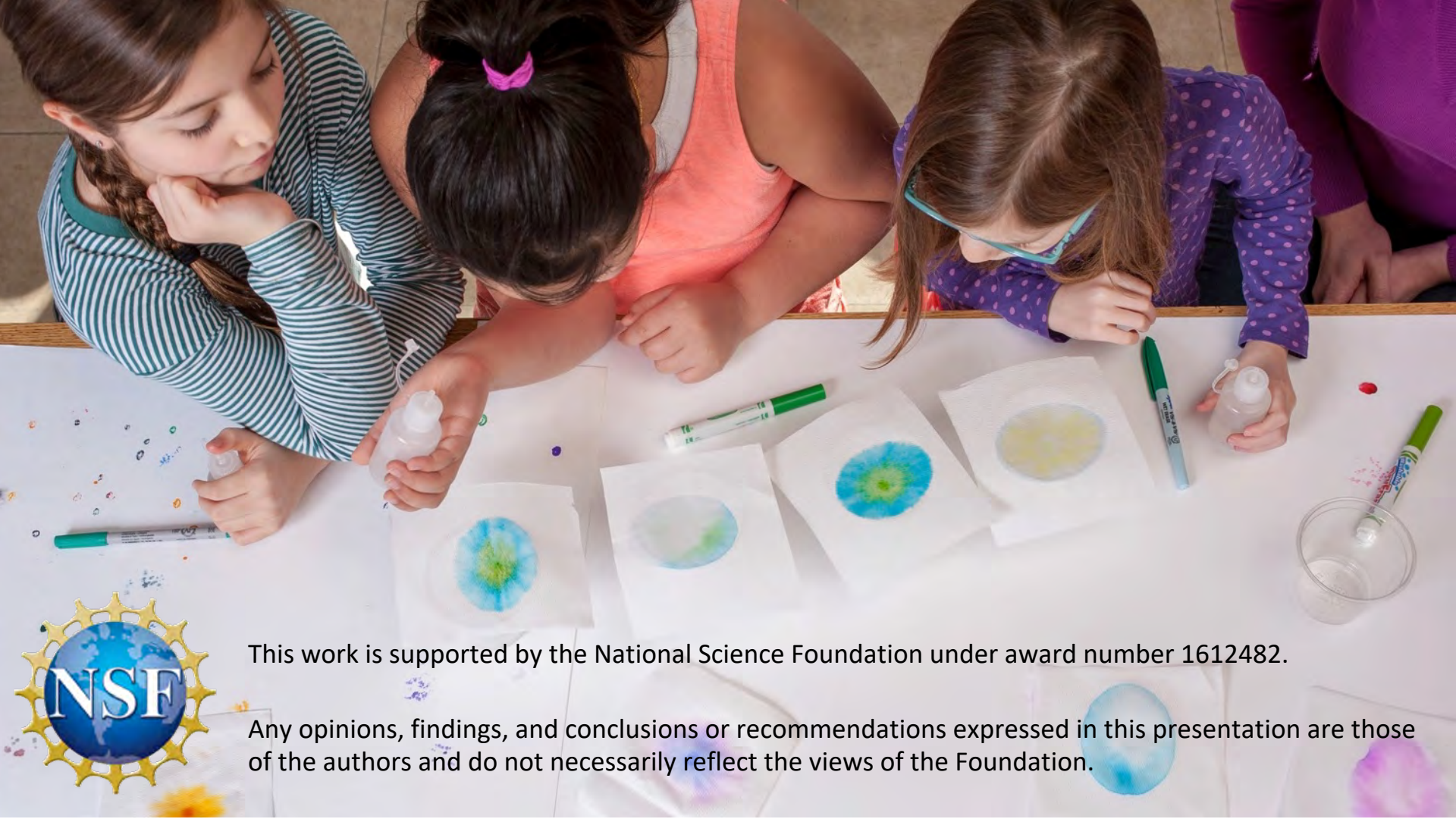
40% of kit recipients reported utilizing ACS volunteers (ACS Local Sections or Student Chapters) for their events

30% of kit recipients reported collaborating with either a museum or ACS group



# Thank you to museum and chemist partners for hosting Explore Science: Let's Do Chemistry events!





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Any opinions, findings, and conclusions or recommendations expressed in this presentation are those of the authors and do not necessarily reflect the views of the Foundation.

**Patti Galvan**  
**American Chemical Society**  
**Washington, DC**

American Chemical Society



# Leverage ACS resources and *Let's Do Chemistry* for National Chemistry Week 2019

Patti Galvan  
22 September 2019

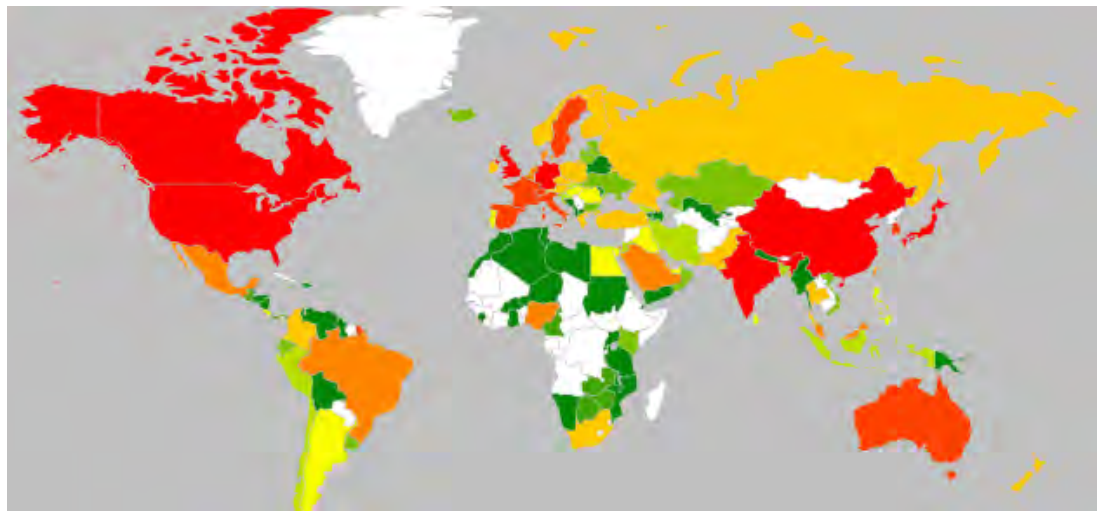


# Who We Are



- A congressionally chartered professional society for chemists and related professionals, and the world's largest scientific society.
- **Vision:** To improve people's lives through the transforming power of chemistry
- **Mission:** To advance the broader chemistry enterprise and its practitioners for the benefit of Earth and its people

# Who We Are



More than 2,500 ACS members in Canada

1 Student Chapter at the University of Toronto Mississauga

81% of membership is in the US

# Why NCW?



- National Chemistry Week (NCW) unites us in communicating the importance of chemistry to the public at the local, national, and global levels to make a positive change in the public's impression of chemistry.



# NCW Reach in the U.S.



- NCW 2017
  - 81% of ACS local sections participated
  - 163K+ issues of the *Celebrating Chemistry* were distributed
- NCW 2018
  - 91% of ACS local sections participated
  - 167K+ issues of the *Celebrating Chemistry* were distributed
  - ACS local sections interacted with more than 75K+ people at in-person events
  - NCW reached more than 25M+ online





# NCW Collaborations



The New York Local Section teams up with 19 universities and nonprofit organizations to host an annual NCW event at the New York Hall of Science for 1,200 attendees



# NCW Collaborations



The Northeast Tennessee Local Section works with Eastman Chemical to provide 1,400 students a day of chemistry



# NCW Collaborations



The Puget Sound Local Section  
teams up a local student chapter to  
visit 23 middle school classrooms



# NCW Collaborations



The Permian Basin Local Section works with three high school ChemClubs to host tables of activities at the local mall and during the annual homecoming float parade



# NCW Resources



## NCW Coordinator Lookup Platform

A screenshot of a web browser displaying the ACS National Chemistry Week Coordinator Lookup platform. The browser's address bar shows "ACS Publications C&EN CAS" and a "Log In" button. The page header includes the ACS logo and the text "National Chemistry Week Coordinator Lookup". Below the header, there is a breadcrumb trail: "American Chemical Society > National Chemistry Week Coordinator Lookup". The main heading is "National Chemistry Week Coordinator Lookup". A sub-heading reads: "You can find National Chemistry Week Coordinators in a local section by entering either your state or a 5-digit zip code." Below this, there are two radio buttons: "Search by Zip Code" (which is selected) and "Search by State". A text input field labeled "Zip Code:" is positioned below the radio buttons. At the bottom of the form is a button labeled "Find National Chemistry Week Coordinator".

[www.ncwlookup.acs.org](http://www.ncwlookup.acs.org)



# NCW Resources

## Educational Resources

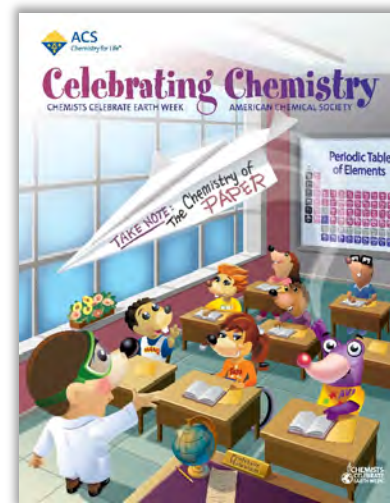
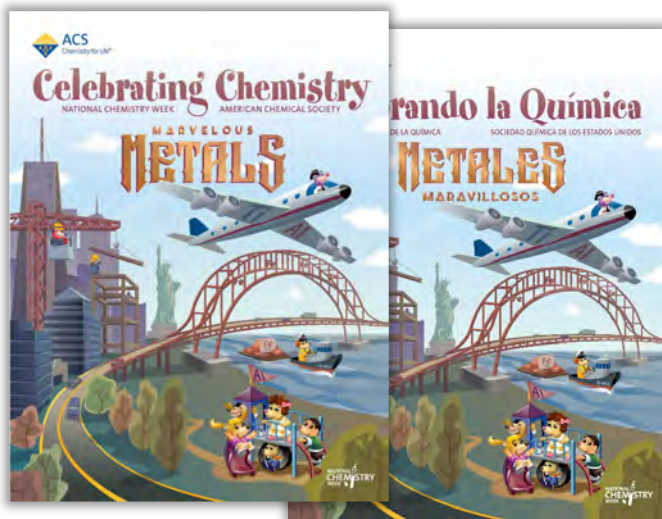


[www.acs.org/ncw](http://www.acs.org/ncw)



# NCW Resources

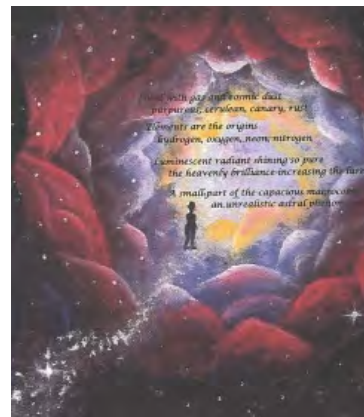
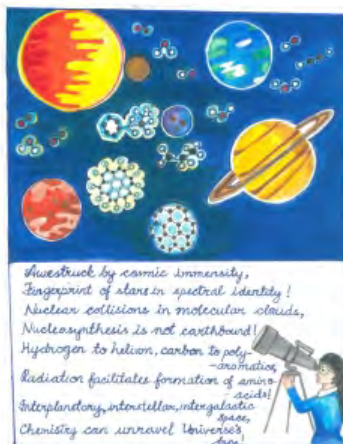
## Digital Celebrating Chemistry



[www.acs.org/celebratingchemistry](http://www.acs.org/celebratingchemistry)

# NCW Resources

## Illustrated Poem Contest



[www.acs.org/ncw](http://www.acs.org/ncw)



# NCW Resources



## Promotional Items

The screenshot shows the ACS Store website interface. At the top, there are navigation links for ACS, Publications, C&EN, CAS, Join ACS, Membership, and My Account. The ACS logo and "Chemistry for Life" tagline are on the left. A search bar and a shopping cart icon (0 items) are on the right. Below the navigation, there is a banner for "NATIONAL CHEMISTRY WEEK MARVELOUS METALS" with a "SHOP NOW" button. Underneath, a "Featured Items" section displays four products:

Item	Price	Members Pay
Proud to be a Chemist Stickers (50/pack)	\$6.00	\$5.40
2019 International Year of the Periodic Table (IYPT) Wallet Cards (50/PK)	\$7.00	\$6.30
2019 NCW Celebrating Chemistry in English - "Marvelous Metals" (250/BX)	\$15.00	\$13.50
2019 NCW Celebrating Chemistry in Spanish - "Metales Maravillosos" (250/BX)	\$15.00	\$13.50

[www.store.acs.org](http://www.store.acs.org)



# NCW Resources



## Design Toolkit

## Social Media

- #NCW
- #NationalChemistryWeek
- Marvelous Metals
- Twitter - @ACS\_NCW
- Facebook - National Chemistry Week



[www.acs.org/ncw](http://www.acs.org/ncw)




## Are you planning a chemistry event during National Chemistry Week 2019?



# NCW Resources

## Find an Event



**National Chemistry Week**  
1 event • 22K likes

- 12 Science Saturday 2019: Marvelous Metals**  
Sat 8 AM - Valdosta State University - Valdosta, GA  
72 people interested
- 20 National Chemistry Week 2019**  
Oct 20 - Oct 26 - Everywhere  
View full National Chemistry Week
- 20 National Chemistry Week**  
Oct 20 - Oct 26 - Rosine State Chemical Society - Oak Ridge, TN  
Search
- 20 National Chemistry Week**  
Sun 11 AM - New York Local Section of the American Chemical Society - Lincoln
- 24 National Chemistry Week: Marvelous Metals**  
Thu 7 PM - Chagrin Falls Branch Library - Chagrin Falls, OH  
1 person interested
- 25 National Chemistry Weekend with America...**  
Oct 25 - Oct 26 - Cincinnati Museum Center - Cincinnati  
6 people interested
- 26 Midland ACS Fall Scientific Meeting- Marvel...**  
Sat 8 AM - The Conference Center at Sagamore Valley...  
2 people interested
- 26 National Chemistry Week: Marvelous Metals**  
Sat 3 PM - Gates Mills Branch Library - Gates Mills, OH  
1 person interested

### Already planned your event?

Promote your NCW event on our Facebook events page!

Submit



Check for  
local events  
in your area!

View all Events

[www.acs.org/ncw](http://www.acs.org/ncw)



**Thank You!**



**NCW 2019 – October 20-26**  
**Questions? Contact [outreach@acs.org](mailto:outreach@acs.org)**

MARVELOUS  
**METALS**  
OCTOBER 20-26, 2019



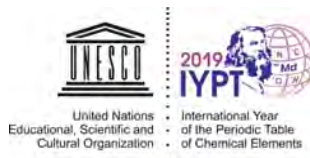
American Chemical Society



# Celebrating the International Year of the Periodic Table of Chemical Elements (IYPT 2019)

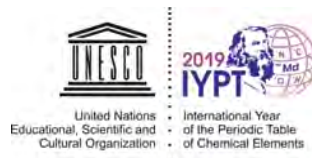
Patti Galvan  
22 September 2019

# IYPT 2019



- 2019 is the 150th anniversary of the publication of Mendeleev's Periodic Table of Chemical Elements in 1869
- IYPT is a celebratory year designated by the United Nations
- IUPAC is the coordination hub for all IYPT events
- ACS is working with IUPAC and other societies on international engagement

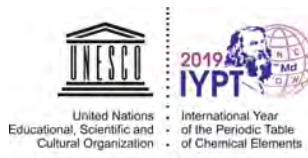
# What's So Special About the Periodic Table?



- Mendeleev's table predicted properties of undiscovered elements
- Final row is complete
- The table continues to evolve



# What Tools are Available



- IYPT Resources

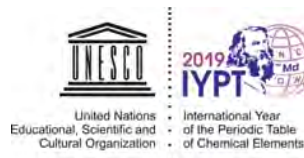
- [www.acs.org/iypt](http://www.acs.org/iypt)

- **Register your event, get free press!**
    - Educational resources by age group
    - Links to interactive tables from around the web
    - Fun facts and videos

- Email: [iypt@acs.org](mailto:iypt@acs.org)

- Send us your questions
    - Get IYPT graphics

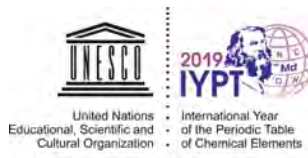
# What's Already Planned



- IYPT Merchandise

- ACS Online Store: Periodic Table Goods, Element Pins
- IYPT Calendar
- IYPT Periodic Table Pins
- IYPT Periodic Table Wallet Cards
- IYPT Member-get-a-member blanket
- IYPT Cupcake Mix

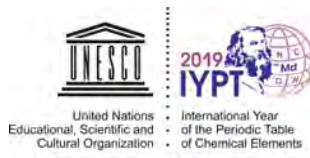
# What's Already Planned



- Recurring Events

- Tuesday Trivia Twitter posts
- Monthly history posts on ACS Axial
- Social Media graphics released by ACS Axial
- C&EN articles

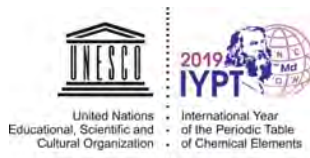
# What's Already Happened



- First Quarter

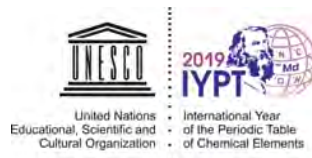
- Jan 29: ACS and IUPAC Opening Ceremony, Livestreamed from Paris
- Feb 11: IUPAC symposium “Women and the Periodic Table of Elements”
- Feb 12: ACS and IUPAC Global Women’s Breakfast
- Feb 16 -17: AAAS Family Science Days
- Feb 26 - 27: Special IYPT Program in a Box
- Feb 28: Capitol Hill Briefing and Reception

# What's Already Happened



- Spring National Meeting
  - #IYPT2019 Social Media Wall
  - Periodic Table giveaways at the ACS Booth
  - HIST Talks on IYPT
  - Mar 30: CCA Presidential Outreach Event
  - Mar 31: Celebratory IAC Reception
  - Mar 31: Student Awards Ceremony theme
  - Apr 1: CCA Outreach Workshop: IYPT and CCEW
  - Apr 2: National Awards Ceremony/Banquet theme
  - Apr 2: C&EN IYPT Trivia Night

# What's Already Happened



- Fall National Meeting
  - Periodic Table lanyard giveaways at the ACS Information Booths
  - CCA Presidential Outreach Event
  - Grady-Stack Award for Interpreting Chemistry for the Public awarded to Sir Martyn Poliakoff and the Periodic Table of Videos: From Test Tube to YouTube
  - Symposium: 150 Years of the Periodic Table, HIST Division
- IAC Reception: Celebrating IYPT 2019
- C&EN and ACS on Campus present Periodic Table Bingo

# What's Already Happened



- ACS and Government

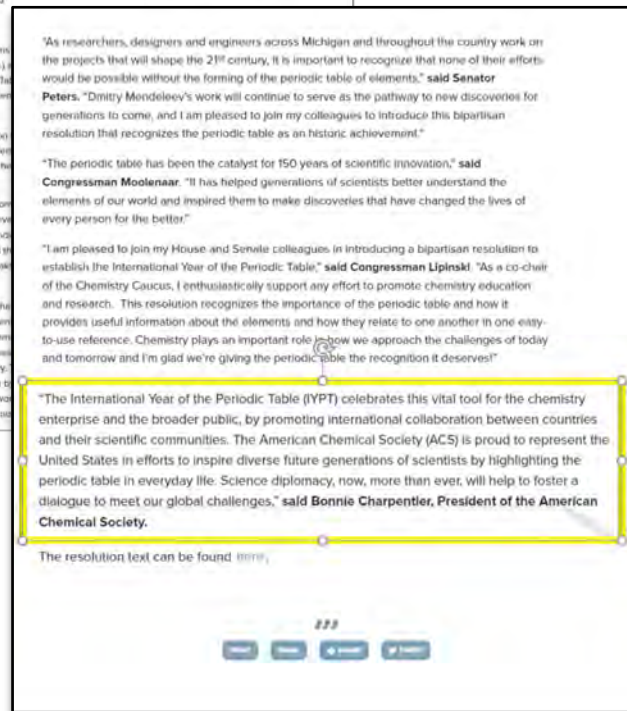
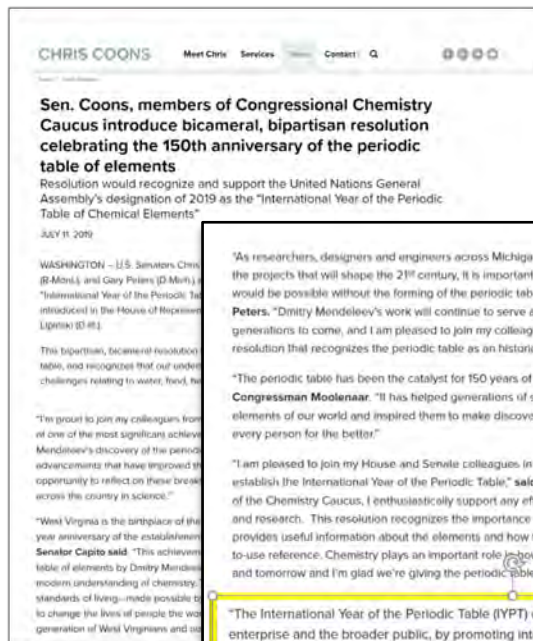
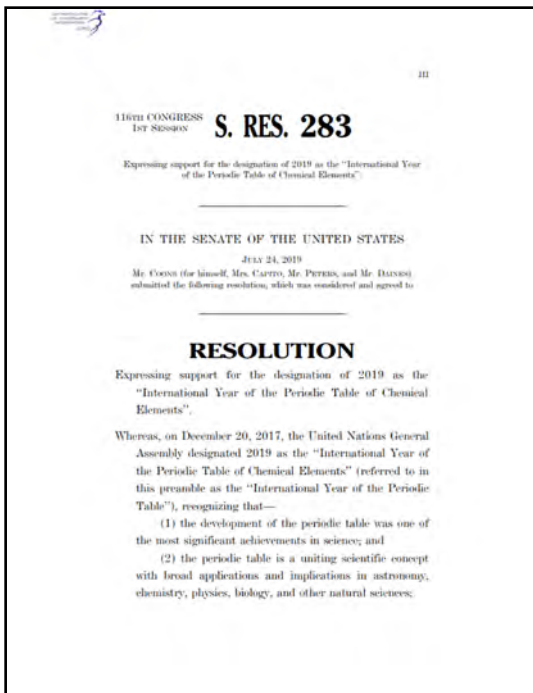
- Capitol Hill receptions and briefings
- State resolutions from South Carolina, Massachusetts, and Puerto Rico
- July 24: Senate resolution unanimously passed!
- House resolution in the works, voting after August Recess
- ACS & Battelle Joint Congressional Briefing and

## Reception, Elements and National Labs, October 23, 2019

- ACS & NSF: IYPT Colloquium “Perspectives in Chemistry: 150 Years of the Periodic Table” at National Academies, November 2019



# IYPT Resolutions: U.S. Senate





# What Are Others Doing?



- **HIST Division**

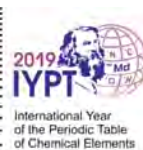
- “The particular item I wanted to report is **searchable online map of places associated with the developers of the periodic table and with the chemical elements**. Each entry contains links to further information about the person, place, or event described. The map is called Places of the Periodic Table”
- [https://www.google.com/maps/d/viewer?mid=1Xey19Nt9afpdL6wc1ysM\\_ZNhKQpQ5ilv&ll=28.563083397360725%2C-38.502264702109414&z=2](https://www.google.com/maps/d/viewer?mid=1Xey19Nt9afpdL6wc1ysM_ZNhKQpQ5ilv&ll=28.563083397360725%2C-38.502264702109414&z=2)

- **Western Michigan Local Section**

- “Our local section of the ACS is organizing an event in October to make the **World's Largest Periodic Table** in honor of National Chemistry Week and IYPT2019. Details on the event can be found our local section website and Facebook page.”
- <https://www.facebook.com/events/2261489874120479/>
- <https://westernmichigan.sites.acs.org/>

# What Are Others Doing?

- **California Local Section**
  - National Historic Chemical Landmark rededication in honor of the discovery of more than a dozen elements at Lawrence Berkeley National Lab (LBNL)
  - 150 guests attended ceremony and reception which included hands-on science experiments.
  - Attendees included:
    - Yumi Nakagawa, LHS Advisory Council Chair
    - Korey Carter, LBNL
    - David Seaborg (Son of the late Glenn Seaborg)
    - Jim Postma, Chair of ACS CA Local Section
    - Attila Pavlath, ACS Past President

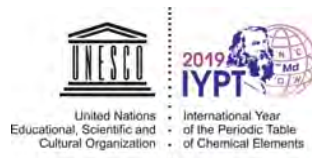


ACS  
Chemistry for Life®



# What Can I Do?

- Tweet or post about chemistry using #IYPT2019
- Host social event(s) celebrating IYPT 2019
- Connect your chemistry programming to the United Nations Sustainable Development Goals
- Organize event(s) in your community specifically to improve public awareness of chemistry's contributions to sustainability
- Organize hands-on science outreach event(s) in your community



- **Participate in National Chemistry Week**



How Will YOU Celebrate IYPT 2019?

[www.acs.org/iypt](http://www.acs.org/iypt)

#IYPT2019

[iypt@acs.org](mailto:iypt@acs.org)

**Emily Belle**  
**Sciencenter**  
**Ithaca, NY**

# Sciencecenter

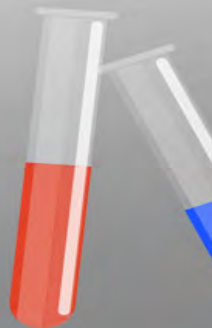
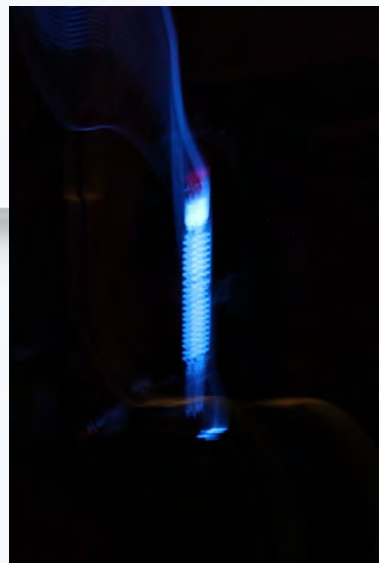
Ithaca, New York





# Chemsations!

Chemistry-based Partnerships







# Program Sustainability

## Red Green Reaction

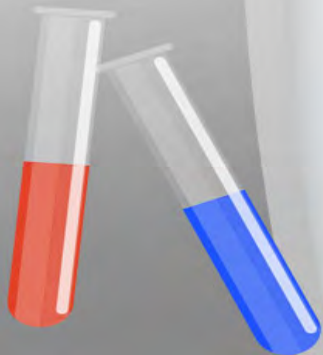
NARRATOR: Magicians can make colors appear and disappear, and so can a chemist.

DEMONSTRATOR: Watch the liquid in this bottle. Do you think I can make it change color? *(Wait for audience response. Pick up the bottle of yellow solution and swirl it gently until the liquid turns orange or reddish.)* What color is it now? *(Audience: red!)* Right! Now it's red. Do you think I can change it again? *(Wait for mixed audience response. Shake the bottle vigorously up and down until the liquid turns green.)* What color is it now? *(Audience: Green!)* Yes, it's green!

NARRATOR: This bottle contains a dye called indigo carmine, which reacts with the oxygen that's in the air to cause the color to change. When we swirl the bottle like this *(demonstrates swirling motion)* a small amount of oxygen reacts with the indigo carmine to slowly change it from yellow to red. When the bottle is shaken *(demonstrates shaking motion)*, more oxygen mixes with the liquid and it causes the red to change to green.

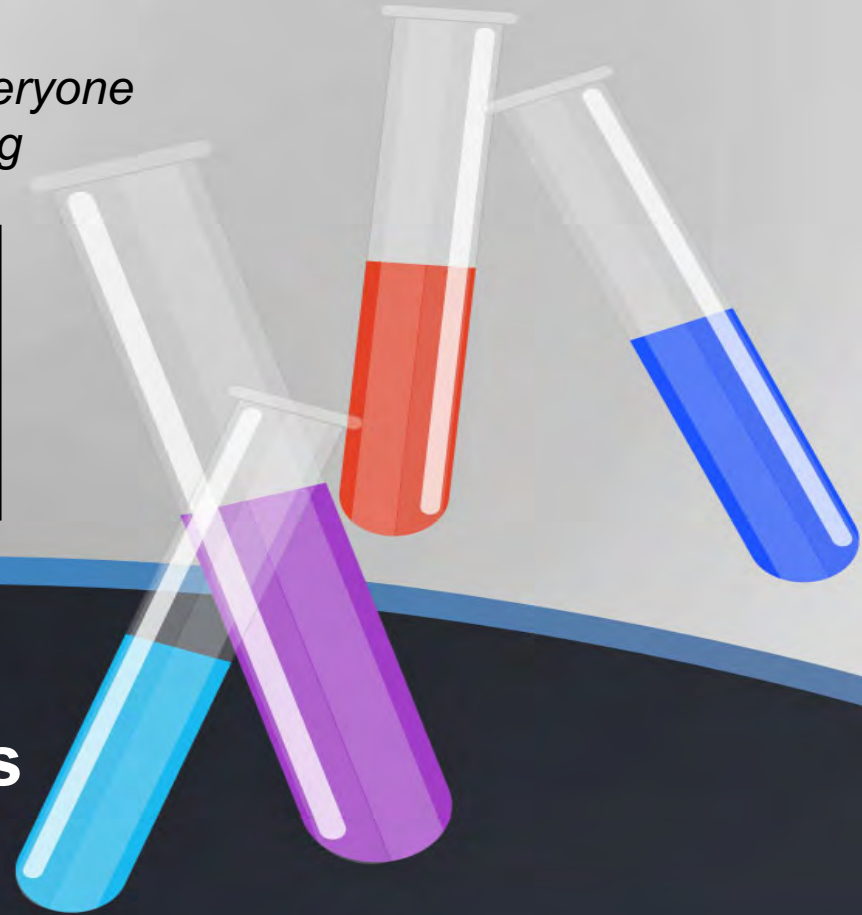
*(Then place the bottle in a visible location.)* Keep an eye on that bottle and let us know if anything happens during the show. *(After a few minutes, the liquid should become red and then yellow again. When an audience member notices, swirl or shake the bottle again.)*

When the bottle is not shaken, sugar, or dextrose, in the solution reacts with the indigo carmine to slowly change it back to yellow and release the oxygen so the reaction can take place all over again. Eventually the dextrose gets used up and the reverse chemical reaction can no longer take place. *(Note to demonstrators: This last section can be explained later when the color changes back and the audience notices.)*



## Accessibility

*Expanding the opportunities for everyone to engage with science by removing barriers*



# Family Science Nights

Chemistry-themed Outreach



# Upstate New York: Tompkins, Schuyler and Tioga Counties





# Partnering with Underserved Schools

## Enfield Elementary Family Science Night

Thursday, October 3  
6:30 - 7:30 p.m.



*Chemistry hands-on activities with the  
Sciencenter!*



*Enter a raffle to win a family membership  
to the Sciencenter!*

 **Sciencenter**  
601 1st St. Ithaca, NY • (607) 272-0600 • [www.sciencenter.org](http://www.sciencenter.org)

# NISE NATIONAL INFORMAL STEM EDUCATION NETWORK



**EXPLORE SCIENCE**

Hands-on fun for everyone

**NanoDays™**

The Biggest Event for the Smallest Science!

**FRANKENSTEIN<sup>200</sup>**



**Soma Chatterji**

**Carnegie Science Center**

**Pittsburgh, PA**

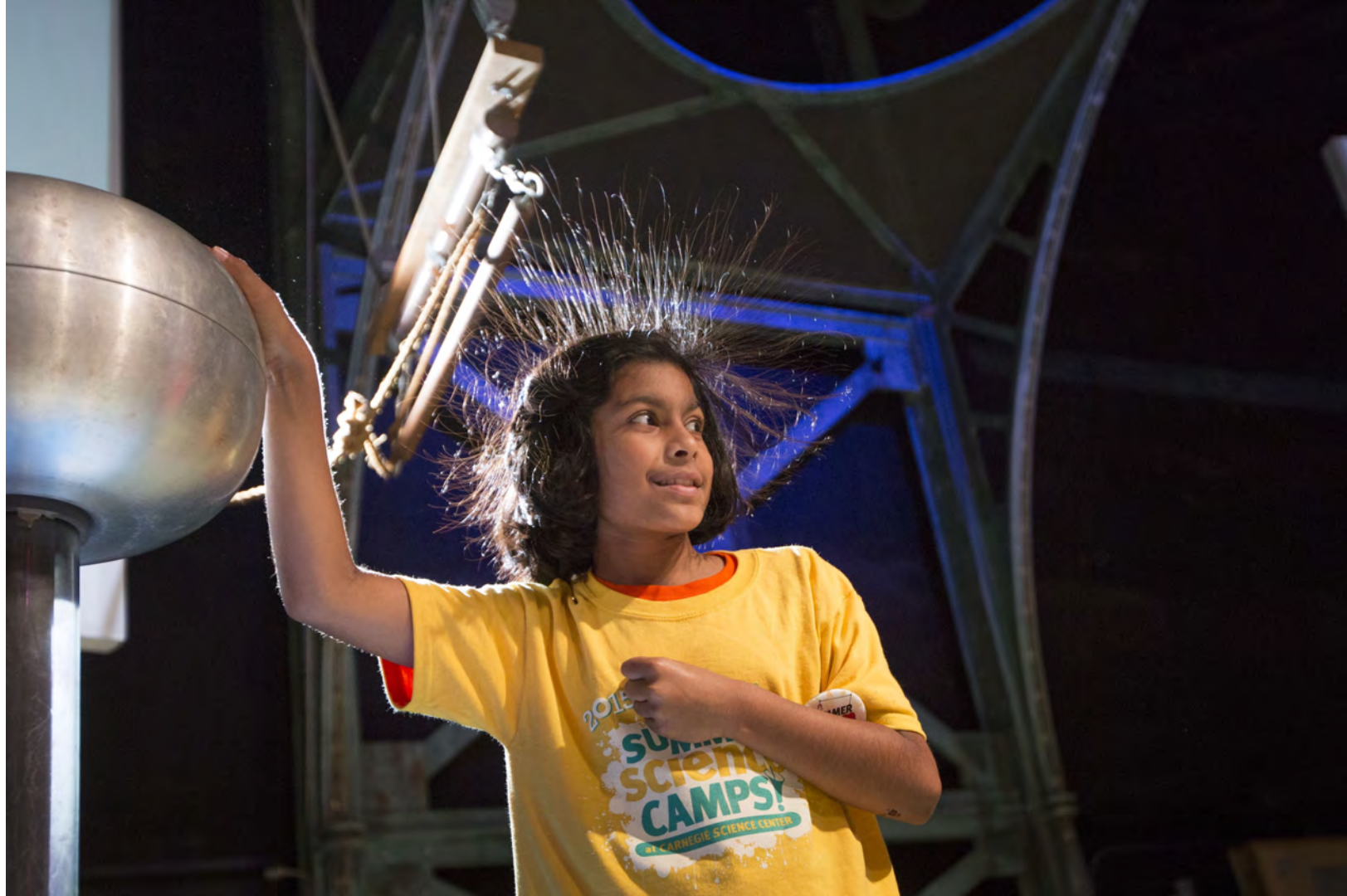




























**Darrell Porcello**

**Children's Creativity Museum**

**San Francisco, CA**

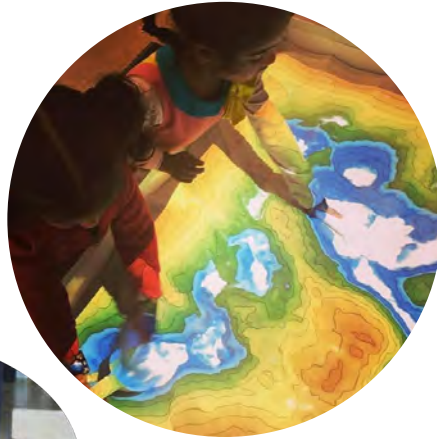


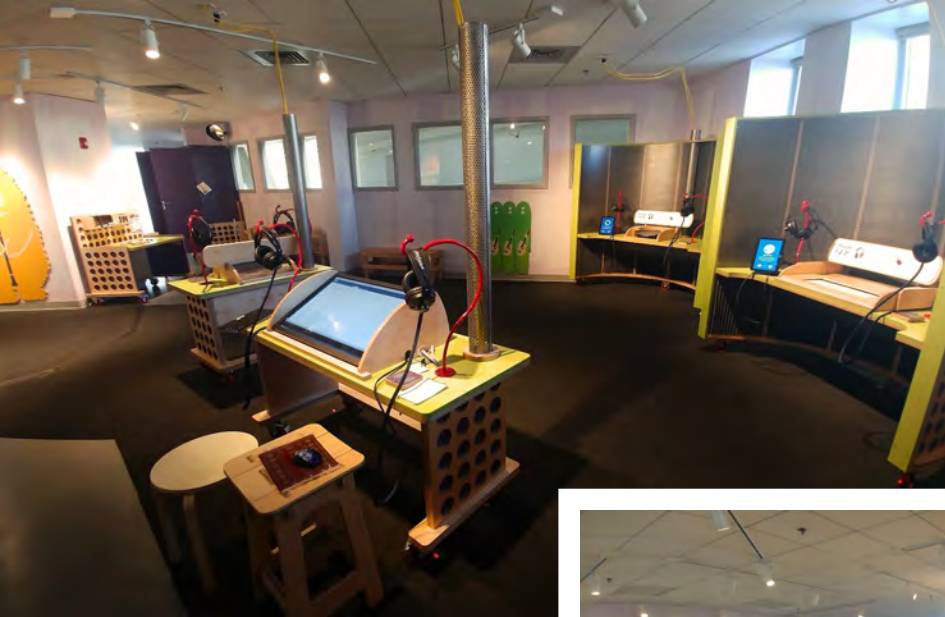
**Darrell Porcello, PhD**  
**Director of STEM**  
**Networks and Partnerships**



**ASTC 2019 | Toronto, Canada**

**To nurture  
creativity and  
collaboration in  
all children and  
families.**







# Boom-Fizz: Sounds of Chemistry workshop



Rocket  
Reactions





# Boom-Fizz: **Sounds of Chemistry** workshop

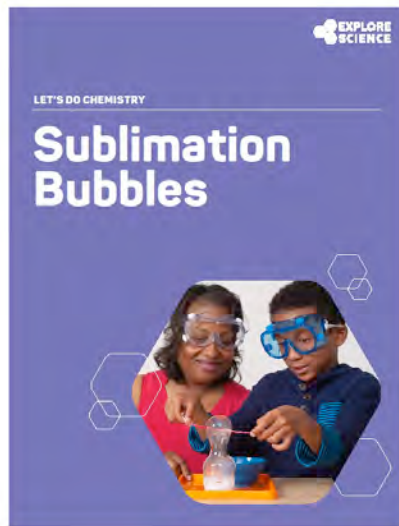


**Fizzzzz!!!**

**Sublimation  
Bubbles**



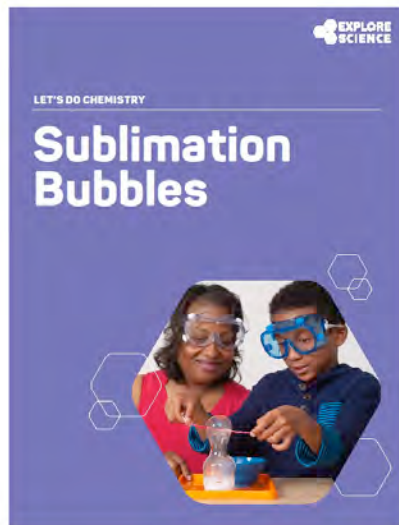
**Boom-Fizz  
Workshop**



**Boom-Fizz  
Workshop**



**Boom-Fizz  
Workshop**



**Boom-Fizz  
Workshop**



**Color Explosion  
Workshop**



**Boom-Fizz  
Workshop**



**Boom-Fizz  
Workshop**

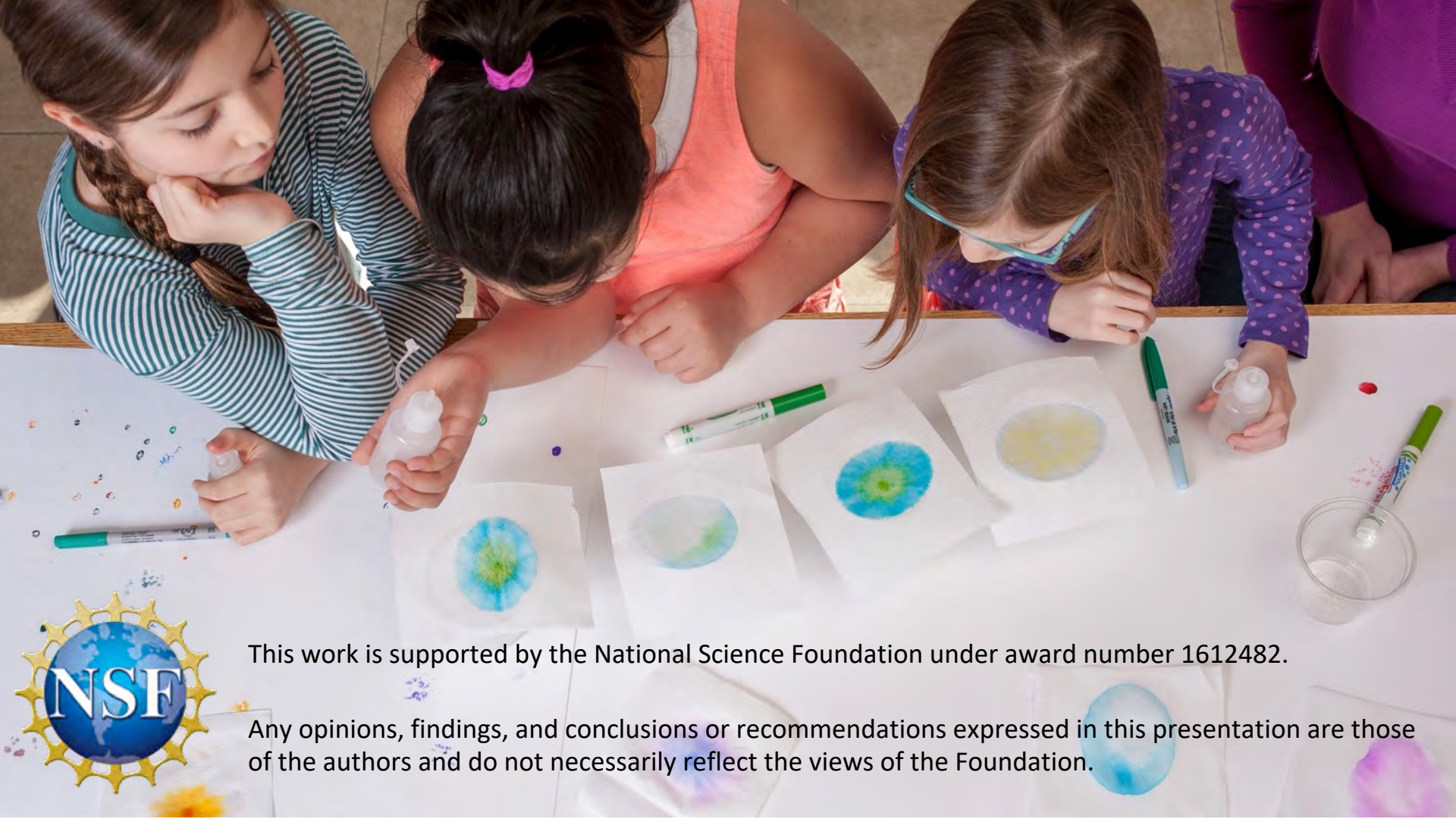


**Color Explosion  
Workshop**



**???  
Workshop**





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Any opinions, findings, and conclusions or recommendations expressed in this presentation are those of the authors and do not necessarily reflect the views of the Foundation.

# Discussion

# Questions

**Addressing fears about  
chemicals and  
chemistry ?**

# Questions

**Getting support from  
institution stakeholders  
and decision makers for  
chemistry ?**



**Questions**

**Event Safety?**

**Questions**

**Special Training?**

# Questions

**Materials handling and  
storage ?**