ABSTRACT: Works of art are complex systems made from diverse materials, from mineral pigments to synthetic polymers to organic substances obtained from plants and animals. Studying the artists’ materials can provide important information on the artifacts’ manufacture, the trade and sourcing of materials, and it can be helpful in developing effective conservation strategies. Several analytical techniques can be used to this purpose and, among these, mass spectrometry-based techniques have emerged that are capable of providing precise information about the composition and origin of biological materials. In this talk we will explore the materiality of an ancient Egyptian cartonnage, a group of 20th century drawings, and a zoomorphic figure from Mali through mass spectrometry.
SPEAKER BIOGRAPHY: Dr. Clara Granzotto is Assistant Conservation Scientist in Conservation and Science at the Art Institute of Chicago. She received her Ph.D. in chemical sciences from the University of Venice, Italy, and the University of Lille, France. Clara conducted post-doctoral research at the Center for Scientific Studies in the Arts at Northwestern University, at the scientific department of The Metropolitan Museum of Art in New York and at the University of Copenhagen, Denmark. She specializes in the analysis of traditional binding media in works of art by mass spectrometry, with a focus on polysaccharides and proteins, to understand artists’ technique, artworks appearance and condition.

PAST MONTHLY MEETING PROGRAMS ON VIDEO

Videos of recent presentations can be accessed at the Chicago ACS Section website [chicagoacs.org / Events / Videos of Past Meetings] or by going directly to https://www.chicagoacs.net/videos/index.html. The section’s archive home page (https://www.chicagoacs.net/) can also get you to the list. Professor Bruce Fouke’s December 10 outstanding presentation on biomineralization will be available soon. Thanks to Milt Levenberg for working out the video technology.

2020-2021 PROGRAMS AVAILABLE ONLINE

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PROGRAM MEETINGS

WINTER / SPRING 2021*

Thursday, February 11
Friday, March 12
Friday, April 23
Friday, May 21
Friday, June 18

* Check chicagoacs.org for the most up to date information

BOARD MEETINGS

Open to Section Members

Thursday, February 4
Thursday, March 4
Thursday, April 15
Thursday, May 6
Thursday, June 10
Thursday, August 5
WHAT ARE PFAS, AND WHY ARE THEY EVERYWHERE?

Harmful PFAS found in drinking water. State issues consumption warning for fish over PFAS contamination. PFAS exposure may increase risk of severe Covid-19.

Headlines such as these appear daily in newspapers and magazines around the world. What are PFAS, how do they impact the environment and our health, and why do they seem to be everywhere?

The acronym PFAS refers to a class of compounds called per- or polyfluoroalkyl substances. This class of compounds encompasses thousands of substances that have been used for almost 75 years as polymerization aids in the manufacture of fluoropolymers, as additives for stain- and water-resistant coatings and textiles, and as surfactants in fire-fighting foams for gasoline, fuel, and other solvent fires.

The signature characteristic of these “forever chemicals” is their exceptional stability due to the presence of strong carbon–fluorine bonds, making them chemically inert and resistant to breakdown either in the environment or our bodies. PFAS accumulate in water and soil, as well as animals and humans, and have been detected in environmental samples across the globe.

The most widely studied—and pervasive—compounds in this class are perfluorooctanoic acid (PFOA), C7F15CO2H, and perfluorooctanesulfonic acid (PFOS), C8F17SO3H, and their salts. Epidemiological data for people exposed to high levels of PFAS at manufacturing sites in West Virginia, North Carolina, Michigan and elsewhere have linked these compounds to a wide range of health effects, including changes in liver function, impaired immune response, and possible reproductive and/or developmental effects. IARC, the International Agency for Research on cancer, classifies PFOA as possibly carcinogenic to humans.

In the United States, large-scale contamination of water supplies with fluorinated compounds predominates in areas near military bases due to the use of these materials in fire-training exercises. Various PFAS, including PFOA and PFOS, are specified as primary ingredients in aqueous film-forming foams for extinguishing airplane fuel fires. More than 175 military sites nationwide have reported PFAS levels up to 100 times the recommended advisory limit in groundwater and drinking water supplies. Cleanup operations are underway, and the Department of Defense has outlawed the use of PFAS-containing foams for maintenance, testing and training. When needed for emergencies the foams are treated as a hazardous spill to prevent discharge into the environment.

Neither PFOA nor PFOS is currently manufactured in the United States. Worldwide production and use of these compounds has also been curtailed by the Stockholm Convention, an international treaty enacted to minimize the effects of these and other “persistent organic pollutants.” Encouraging signs relative to the declining use of PFOA and PFOS are offset, however, by their replacement with newer, different, untested chemicals. They are being replaced by chemicals with shorter perfluoroalkyl chains, such as C4 and C6, by partial substitution of –CF2– groups in the fluorinated alkyl chains with –CH2– groups, and by breaking up the perfluoroalkyl chains with ether and other functional groups. These strategies are intended to increase the possible biodegradation and metabolism of the substances while preserving their functionality. The basic premise of this strategy has not been validated.

We can demonstrate a Safety First! commitment to environmental health and safety by supporting government policies that require manufacturers to study the possible toxic effects of chemicals intended for consumer use.

Submitted by Irene Cesa
Thanks everyone who attended our January monthly meeting, which included the annual session with our colleagues from AIChE (American Institute of Chemical Engineers). It was a wonderful event! And it was great seeing so many familiar faces and new ones in our virtual gathering.

We had more than 130 members and friends attend the meeting to hear a fascinating and historical look at the rise of the blast furnace. Rick Rateick, Adjunct Assistant Research Professor at the University of Illinois Champaign Urbana and CEO of REXP2 Research, gave a presentation that chemists of all ages and levels could enjoy, appreciate, and learn from. It was interesting to hear how and why the blast furnace is designed the way it was and all the chemistry that goes on in making steel. I came away from the meeting wanting to learn more about the subject. If you missed our monthly meeting, please go to chicagoacs.org and choose Videos of Past Meetings [under Events] to view the video of the talk.

Even though January is over, the year is off to a great start! We have several meetings and talks planned with guest speakers from around the Chicagoland area, in addition to well-known speakers from across the country. Please look at our calendar for information about our future meetings.

For our February talk, the Chicago Art institute will join us. They will discuss their conservation efforts for some of our beloved treasures. This will be another talk that I believe all our members and community members will enjoy. It will be a fascinating look at the connections between art and chemistry.

Please take note that we have moved our beloved Gibbs Awards night until the fall. We hope this will allow us to provide either a hybrid or in-person event to honor our 2021 winner, Sharon Hammes-Schiffer of Yale University. We are trying to stay reasonably optimistic for what the future might bring.

In May, we would like to have a virtual celebration for all educators and students who made it through the unprecedented school year. The plan is to have Raychelle Burks of Outrageous Acts of Science and ACS Reactions short video clip series speak. Please join us as she speaks about the fascinating insights on chemistry and pop culture.

We also have many other great opportunities for our members and community alike planned. Virtual events, contests, and celebrations for Earth Day and National Chemistry Week are just a few things planned for the year ahead. Be sure to check the chicagoacs.org website for updates, information and opportunities to participate in all the fun and excitement we have in store!

If you have any comments, questions or ideas, please reach out to me: chair@chicagoacs.org

Sherri Rukes, Chicago Section Chair
**A NEW RESOURCE FOR TEACHERS + THE COMMUNITY ALIKE!**

Chemistry Shorts is a new series of brief films that spotlight innovative ways that chemists and chemical engineers are working to solve important problems and create new opportunities. Each film is accompanied by a lesson plan that offers suggestions on how to integrate it into the classroom. The first three films and lesson plans (listed below) are available at [https://chemistryshorts.org/](https://chemistryshorts.org/)

- **Direct Air Capture & The Future of Climate Change, with Christopher Jones (Georgia Tech)**
- **Under the Skin, with Zhenan Bao (Stanford and the Gibbs Medal winner for 2020)**
- **Rewriting Life, with David Liu (Harvard)**

Chemistry Shorts is also on [YouTube](https://www.youtube.com) and [Twitter](https://twitter.com). This venture is sponsored by The Camille & Henry Dreyfus Foundation and is endorsed by ACS, AACT (American Association of Chemistry Teachers), and AIChE (American Institute of Chemical Engineers).

**communicating the breadth & depth of chemistry’s impact on humankind**

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**Teacher Kit Information & Updates**

The Chicago ACS Section has 50 K-12 educator experiment kits. These kits will have supplies and instructions for teachers to use in their classroom. Please fill out the [linked form](https://example.com) to sign up to receive a kit. Kits will be available in late January / early February at several locations. Videos about the activities will be linked on the website for teachers to be able to understand the ‘how’ and ‘why’ about an activity. There are over 12 experiments that can be performed multiple times. Topics with this kit include:

- Stoichiometry
- Intermolecular Forces - Making a Lava Lamp
- Gas Properties and Laws - Growing Marshmallow, Inflating a Balloon, Fire Extinguisher
- Density • Crystal Formations • Solutions
- Types of Compounds
- States of Matter and Properties of Matter

More kits will be available throughout the year for teachers to do demonstrations and labs with their students. Please stay tuned for more information about the forthcoming kits, which are tentatively scheduled to be out in late March / early April.

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ALL K-12 EDUCATORS can receive Continuing Professional Development Units (CPDUs) for attending our Monthly Meetings.

Register for the meeting as a “CPE” or “CPDU” attendee at [chicagoacs.org](https://chicagoacs.org)
Greetings on behalf of the Chicago ACS College Education Committee, a part of our Section’s Education and Outreach Division. The College Education Committee exists to work with the ACS Student Chapters in the territory of the Section (which includes northwest Indiana) to assist with their growth and the professional development of students. This includes preparing and hosting activities during National Chemistry Week and Chemists Celebrate Earth Day. During the past few years, we have also enjoyed bringing opportunities for undergraduate students to present their research work in the form of posters at our Monthly Section Meetings. Perhaps you or a student of yours has participated in the past.

With the onset of the COVID-19 pandemic last year, the Section has elected not to meet in person for Monthly Meetings. Instead, our meetings have convened virtually, which has its benefits and rewards. However, there have been no opportunities for students to present posters during those events. We are acutely aware that for students, engaging in the enterprise of education has been especially stressful and challenging, and hardly conducive to conducting research in the laboratory. We realize that some students may have been able to work on their projects and that they may have reached some meaningful conclusions. Perhaps some students even have posters ready to present, but have nowhere to present them. Therefore, the College Education Committee is organizing a Virtual Symposium Day for undergraduate students in order to offer them a chance to present the results of their research to the Chicago Section audience and practice presenting their posters prior to the ACS Spring 2021 Meeting, which will take place online from April 5-16, 2021.

If you have a student ready to present a poster, or planning to present a virtual poster at the ACS Spring 2021 Meeting, what better way is there to showcase their work locally and give them a chance to practice presenting in the virtual environment? There will even be some prizes available for the best posters as judged by the Committee!

The Virtual Symposium Day will be held on Saturday, February 27. Undergraduate students who wish to present a poster may register at the link accessible on the Chicago ACS Website. Students presenting posters will be instructed to load their poster into a secure location beginning on February 25 so that it can be viewed by members of the Section prior to the presentations. On Saturday, February 27, students will join a teleconference on Zoom where they will share their screens and deliver 15-minute presentations about their work, with a few minutes for Q&A from the audience. The event will be moderated by a member of the Chicago ACS College Education Committee.

We hope that you will encourage your students to present their work and we hope to see you online for the presentations on February 27!

We anticipate that the Virtual Symposium Day will be a unique opportunity for students to present in the virtual environment . . .

. . . and for members of the Chicago ACS Section to learn about the amazing research being done by students and their mentors at colleges and universities in the greater Chicago metro area.
Dear Readers,

It has been my good fortune, for over a dozen years now, to work as the personal assistant to a Chemistry Nobel Laureate here in the Chicago area. One of the perks of this situation is that I get to be in contact with prominent chemists all over the world and to learn about their scientific research. Quite frequently, we are asked by individuals to nominate them for a prize or award offered by an organization, such as the American Chemical Society, the Royal Society of Chemistry, the Wolf Foundation and many others, including even the Royal Academy of Sweden for the Nobel Prize. A nomination package typically consists of a carefully prepared set of documents: a letter of nomination, a curriculum vitae (short or longer), a statement of scientific or volunteer achievements, and a list of significant publications or other measure(s) of esteem highlighting the theme of the award. Those of you who have submitted nominations for ACS Fellowship know well the effort involved in getting all the documentation ready! I view this work as an opportunity to help launch an individual chemist, or group of chemists, into the next level of success and recognition. In addition, there are letters to be written in support of nominations made by others in the broader chemistry community.

Early and mid-career chemists, in particular, should keep an eye out for award opportunities. Offer to prepare, if possible, a draft letter or list of bullet points to make the nominator’s task easier. Take advantage of the initiatives offered by ACS to jump-start or further your career – webinars, job-search resources, letter-writing workshops, employment counselors, videotaped elevator speeches and so on. Plan to present an account of your accomplishments at regional, national and virtual venues. Our bulletin archives also contain valuable job-related advice and suggestions.

Please stay well as the pandemic continues. I hope you enjoy this issue. Send comments, questions and ideas for articles to editor@chicagoacs.org – Thank you.       ~~ M. E. S. ~~

From the Editor’s Desk
UPCOMING EVENTS IN 2021

For information on future meetings and events please refer to the Section’s website chicagoacs.org, Chicago ACS Section Social Media, and future bulletin issues. See page 2 for monthly meeting dates.

February 27  Virtual Symposium Day (see article on page 6)
April 5-16  ACS Spring National Meeting: 2nd Century of Macromolecular Chemistry
April 18 - 24  Chemists Celebrate Earth Week (CCEW) - Reducing Our Footprint with Chemistry
April 18-23  AIChE 2021 Spring Meeting and 17th Global Conference on Process Safety
June 14-16  25th Annual Green Chemistry & Engineering Conference - “Sustainable Production to Advance the Circular Economy”
August 22-26  ACS Fall National Meeting: Resilience of Chemistry
September 17  Gibbs Medal Award Dinner

Great Lakes Regional Meeting 2021: June 6–9, 2021

~~~ Elevating the Importance of Diversity and Inclusion in Chemistry  ~~~

• GLRM 2021 will be held virtually, hosted by the Minnesota Local Section. Abstract submission is now open with a deadline of March 1st. A list of proposed symposia is on the main web page. Submissions can be made at glrm2021.org by clicking on the abstract submission link. Meeting registration opens March 1st.

• Information about nominations for four awards – Stan Israel Award for Advancing Diversity (deadline March 1st) • Ann Nalley Award for Volunteer Service • Partners for Progress and Prosperity Award • Excellence in High School Teaching Award can be found on the website by clicking on the awards link. The latter three awards nominations are due April 1st.

OUTBREAK EVOLUTION ACROSS THE GLOBE: Cumulative cases reported on May 1, 2020 (185 days, left) and January 26, 2021 (370 days, right) after the start of the pandemic (defined as 50 cases reported). https://coronavirus.jhu.edu/data/animated-world-map
Chicago ACS Section Leadership for 2021

Officers
Chair Sherri Rukes chair@chicagoacs.org
Vice Chair Michael Koehler vice-chair@chicagoacs.org
Chair-Elect Mark Cesa chair-elect@chicagoacs.org
Secretary Aleks Baranczak secretary@chicagoacs.org
Past Chair Paul Brandt past-chair@chicagoacs.org
Treasurer Jason Romero treasurer@chicagoacs.org

Directors (directors@chicagoacs.org) Term
Veronica Berns 2020-2021
Mark Cesa 2020-2021
Lauren Jackson 2020-2021
Katie Leach 2020-2021
Michael Morello 2020-2021
Rebecca Sanders 2020-2021
Vivian Sullivan 2020-2021
Julia Wiester 2020-2021
Omar Farha 2021-2022
Katherine Gesmund 2021-2022
Samantha Harvey 2021-2022
Margy Levenberg 2021-2022
Jana Markley 2021-2022
Oluseye (Kenny) Onajole 2021-2022

Councilors councilors@chicagoacs.org
David Crumrine 2019-2021
Margy Levenberg 2019-2021
Milt Levenberg 2019-2021
Inessa Miller 2019-2021
Susan Shih 2019-2021
Ken Fivizzani 2020-2022
Paul Brandt 2021-2023
Russ Johnson 2021-2023
Fran Kravitz 2021-2023

Alternate Councilors altcouncilors@chicagoacs.org
Katie Leach 2019-2021
Tim Marin 2019-2021
Rebecca Weiner 2019-2021
Josh Kurutz 2020-2022
Omar Farha 2020-2022
Ilana Lemberger 2020-2022
Mark Cesa 2021-2023
Sherri Rukes 2021-2023
Becky Sanders 2021-2023

For additional information see:
https://chicagoacs.org/board.php
https://chicagoacs.org/Committees
https://chicagoacs.org/Volunteer

The Chicago Section’s committees adopted a new structure in January 2020. Five divisions now compose the Chicago ACS board: Administration, Communication, Education & Outreach, Membership, and Science. Our various committees are grouped within this division structure where common themes, goals, and purposes align. We have purposefully included a means for succession planning for our Committee Chair and Division Chair roles and a mentoring strategy for the people working within them. We anticipate that this structure will bring us increased efficiency, impact, and effectiveness.

SECTION CONTACT INFORMATION: The following email addresses corresponding to committees roles should be appended with: chicagoacs.org (e.g., a-v-support@chicagoacs.org)

Elected Officials
chair@chicagoacs.org
chair-elect@chicagoacs.org
past-chair@chicagoacs.org
vice-chair@chicagoacs.org
secretary@chicagoacs.org
treasurer@chicagoacs.org

coordinator-member@

Finance
budget@
comptroller@
trustees@

Communication Division
coordinator-
communication@
editor@
pr@
news@
social@
web@

Education & Outreach Division
coordinator-edu-outreach@
education@
aact@
collegeed@
continuing-ed@
cps@
k12@
publicaffairs@
outreach@
community@
statefair@
seed@

Membership Division
communities@
minority@
sons@
wcc@
ycc@
membership@
jobs@
nominations@

Science Division
awards@
hs-teaching@
steggli@
safety@
program@
glm@

Administrative Division
coordinator-admin@
development@
house@
a-v-support@
gibbsarr@
hospitality@
office@
programarrange
ments@
lrp@
policy-bylaws@
How to Measure It

ACROSS
1. How to measure heat transfer (with 23 across)
7. How to measure concentration pressure (with 23 across)
11. Organic-rich soil
15. Old building toppers
16. Blackened residue
17. It takes two to _____
18. Stop
19. Singer Braxton
20. Not equatorial
21. Angioplasty appliance
22. Starbucks offering
23. It's how you measure it!
24. With 65 down, bay area city & county name
25. Colorful silica gem
27. _____ at your own risk
29. Clear out completely
30. Get enough of
31. M.S. students in the undergrad lab
34. Wild cat
37. Computer brain
38. French recipe
41. Points of concern
42. Zero a balance
44. Trihydrogen mononitride
45. At _____ for words
47. How to measure solution density (with 23 across)
49. Sets to explode
50. To the point
52. Story
54. Lomond or Ness
55. Three-carbon sugar
56. Attempt
57. Twenty in the Gettysburg Address
60. Sound that comes back around
63. Religious group under vows
64. Get up in the morning

DOWN
1. Uncouth
2. Largest diameter artery
3. 1950s-1960s actress Sophia
4. Hansel and Gretel were headed for this
5. Recondition
6. Suffix with sex or capital
7. Base-eight
8. It's worth a _____
9. French for coat
10. Align
11. Less rigid
12. I'll get right _____
13. Culture medium
14. Nickname for element 42
17. Domesticated
22. Boy
26. 18th century British statesman, namesake of PA's second city
28. Timeframe of service
30. How to measure light wavelength (with 23 across)
31. Multidimensional equivalent to a vector
32. Per item
33. Squirrel away
34. Chartreuse, cerulean, and cream, e.g.
35. Classic and symbolic
36. How to measure liquid flow (with 23 across)
37. _____ me a river
39. Voltage, abbrev.
40. How to measure electrical charge (with 23 across)
41. Bases for conclusions
43. Hominid
44. Online service provider now merged with Time Warner
46. A sib
48. Vote of disfavor
51. Initiate crystallization
53. Hoy _____ soleado
56. "_____ the Looking Glass"
58. Alkaline earth metal critical for good health
61. Redact
63. Egg-shaped
64. Get up in the morning
65. See 24 across
66. Don't try to _____
67. Showing activity
68. Basil and olive oil sauce
69. Silent film era mega-star Lillian
70. Seat of the caesars
71. Smallest amount of an element
72. Wanderer
74. Finalize a deal
76. Smallest degrees of concern
77. Spades, e.g.
78. N.Y. or S.F. team
79. What Samson did to the Philistines
80. Leer at
81. Heads of state meeting
82. Iron porphyrin group
83. How to measure stress/strain relationship (with 23 across)
84. How to measure electrical current (with 23 across)
85. CO2 _____ and trade
69. How to measure weight change (with 23 across)

This puzzle first appeared in the Fall 2020 issue of Chemistry Distillations, the newsletter of the Department of Chemistry, College of William & Mary. Robert Pike has given permission to reproduce it here.