

The Chemical Bulletin

A publication of the Chicago Section of the American Chemical Society



ACS Local Section
Chicago

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CHICAGO SECTION MEETING Joint Meeting with Joliet Section

WEDNESDAY, NOVEMBER 20, 2019

**Concordia University Chicago
7400 Augusta Street - River Forest, IL**

**5:30 - 9:00 p.m. | Student Poster Session followed by
Pre-dinner Talk, Dinner, Presentation, and Book Signing**

"The Disappearing Spoon"



SAM KEAN

Award-Winning Author

Science Communicator and Raconteur

Lecture Abstract: Why did Gandhi hate iodine? Why did the Japanese kill Godzilla with missiles made of cadmium? How did radium nearly ruin Marie Curie's reputation? And why did tellurium lead to the most bizarre gold rush in history? The Periodic Table is one of our crowning scientific achievements, but it's also a treasure trove of passion, adventure, betrayal, and obsession. *The Disappearing Spoon* delves into every single element on the table and explains each one's role in science, money, mythology, war, the arts, medicine, alchemy, and other areas of human history, from the Big Bang through the end of time. Book sales and signing to follow.

PROGRAM

Concordia University Chicago
7400 Augusta St, River Forest, IL 60305
(708) 771-8300 | CUChicago.edu

5:30 p.m.

Registration begins

Koehneke Community Center (map #14)

6:00 – 6:30 p.m.

Student Poster Session (Room SLL)

Koehneke Community Center 2nd Floor

6:30 – 6:45 p.m.

Pre-dinner Presentation (Room OPRF)

Koehneke Community Center 2nd Floor

6:45 – 7:45 p.m.

Dinner (Room OPRF)

Koehneke Community Center 2nd Floor

7:45 – 8:45 p.m.*

Presentation by Sam Kean

Chapel of Our Lord (map #5)

8:45 p.m.

Book signing

Ferguson Art Gallery (outside chapel)

* Off-Site Streaming of the 7:45 p.m. presentation:
Location(s) to be determined. Check for updates at:
chicagoacs.org

Dinner Registration Deadline:
12:00 Noon on Tuesday, November 5

Lecture-only Registration Deadline:
12:00 noon on Thursday, November 7

DINNER TICKETS - Register by Nov 5

REGISTER NOW

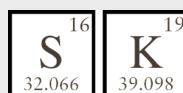
\$20 DINNER - Same for all registrants

There is no charge for poster viewing or to attend
the pre-dinner talk or lecture (without dinner)

Buffet Dinner Menu

Check for updates at: chicagoacs.org

Presenter Biosketch



Sam Kean is the New York Times bestselling author of five books, including *The Bastard Brigade*, *The Dueling Neurosurgeons*, and *The Disappearing Spoon*. His stories have appeared in *The Best American Nature and Science Writing*, *The New Yorker*, *The Atlantic Monthly*, *The New York Times Magazine*, and *Slate*, and his work has been featured on NPR's "Radiolab," "Science Friday," "All Things Considered," and "Fresh Air."

Photo credit (page 1) : By DisappearingSpoon - Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=68331516>

This special International Year of the Periodic Table event is hosted jointly by the Joliet and Chicago Local Sections.

* STUDENT POSTER REGISTRATION *

Undergraduates can present posters describing their research, and the best one will win a prize!

*** REGISTER your poster here ***

https://chicagoacs.org/form.php?form_id=54&c=1

PARKING / Map & Directions

Google map: [Directions](#)

Campus map: <https://www.cuchicago.edu/admission-financial-aid/undergraduate/visiting/maps-and-directions/>

Parking lot and garage are adjacent to Koehneke Community Center (#14 on campus map), accessible from Bonnie Brae (between Augusta and Division)
No garage permit needed after 2:30 pm

QUESTIONS OR NON-WEB RESERVATIONS?

Please contact the Section Office via phone (847-391-9091) or email (info@chicagoacs.org)

TEACHERS! All K-12 Educators Can Receive Continuing Education Credits For Attending Our Meetings. Obtain Your CE Form at the Registration Desk.

SAFE HAZARDOUS WASTE DISPOSAL

A "SAFETY FIRST" MINUTE

This installment in our monthly **"Safety First"** series was inspired by a question or comment I received after a previous posting. Students wanted to know what happened to or what was the ultimate fate of hazardous wastes collected in their college laboratories and then transported off-campus by licensed waste-disposal companies. I won't pretend this is a subject that can be answered in a minute, or even an hour, or possibly a month for that matter. The simplest answer I can give to this question is "It's complicated!"

In contrast to commercial organizations, teaching and research labs typically generate relatively small quantities of many different types of characteristic hazardous waste. Requiring separate treatment of small amounts of individual waste streams would be unduly complex and costly. In most cases, therefore, when these laboratory wastes are collected they are packaged into what are called lab packs. These are defined as containers, typically 55-gallon drums, filled with small quantities of compatible laboratory chemicals, which are segregated into characteristic groups. The containers are typically packed with absorbent material, labeled, and then shipped to treatment, storage, and disposal facilities.



The EPA has established lab packs as an alternative treatment standard, basically allowing the entire contents to be incinerated. The residue or ash resulting from incineration of toxic hazardous wastes -containing heavy metals

such as barium, cadmium, chromium, lead, and silver - must be stabilized to prevent leaching of these metals before the ash can be placed in a "normal" landfill. Stabilization is accomplished by adding cement and allowing to the mixture to solidify for up to one month.

Many ignitable or flammable organic solvent waste streams are taken to fuel-blending facilities where they are combined to produce alternative fuels for kilns used in manufacturing cement. This treatment option converts waste into energy and reduces its negative effect on the environment by cutting the amount of waste going to landfills while also decreasing reliance on fossil fuels. Cement kilns* operate at very high temperatures (approx. 1500 °C) for long periods of time, maximizing the energy value of the organic waste.



Hazardous waste treatment is a complex and perhaps not very appealing subject. I'm glad the students asked the question, however, because I think it points to the need for a "hidden" value, namely, trust, in our safety culture. We can - and indeed, we must - compel compliance with hazardous waste protocols based on regulations. But, being human, we also recognize that compliance will always be greater when it is based on trust rather than legal compulsion. As scientists we need to be able to trust in the importance of best safety practices for the "greater good."

Thank you for your continued support of **"Safety First"** in the ACS Chicago Section. I look forward to your suggestions for new discussion topics.

Respectfully submitted,
Irene Cesa

* Photo depicts the hot end of a medium-sized modern cement kiln, showing tyres, rollers and drive gear (Source: <http://en.wikipedia.org/w/index.php?title=File:KilnBZ.JPG>)

Section Election Results

The Annual Election of Officers of the Chicago ACS Section ended on Friday, October 18, 2019. These results are based on 434 ballots (of 464 received).

Chair-Elect – Sherri Rukes

Vice-Chair – Josh Kurutz

Secretary – Tanya Ivushkina

Treasurer – Andrea Twiss-Brooks

Directors (8) – Julia Wiester, Rebecca Sanders, Veronica Berns, Katie Leach, Mark Cesa, Vivian Sullivan, Lauren Jackson, Michael Morello

Councilors (1) – Ken Fivizzani

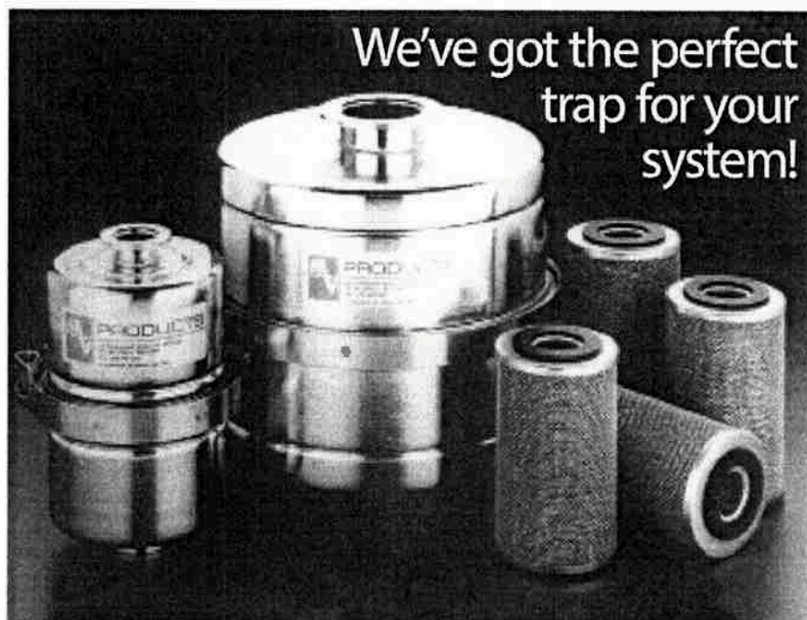
Alternate Councilors (3) – Josh Kurutz, Ilana Lemberger, Omar Farha

The mission of the Chicago Section of the ACS is to advance the chemical sciences and their practitioners for the benefit of Earth and its peoples.



Image credit: *The Blue Marble* by the crew of Apollo 17 (1972); M.E Schott design (2014).

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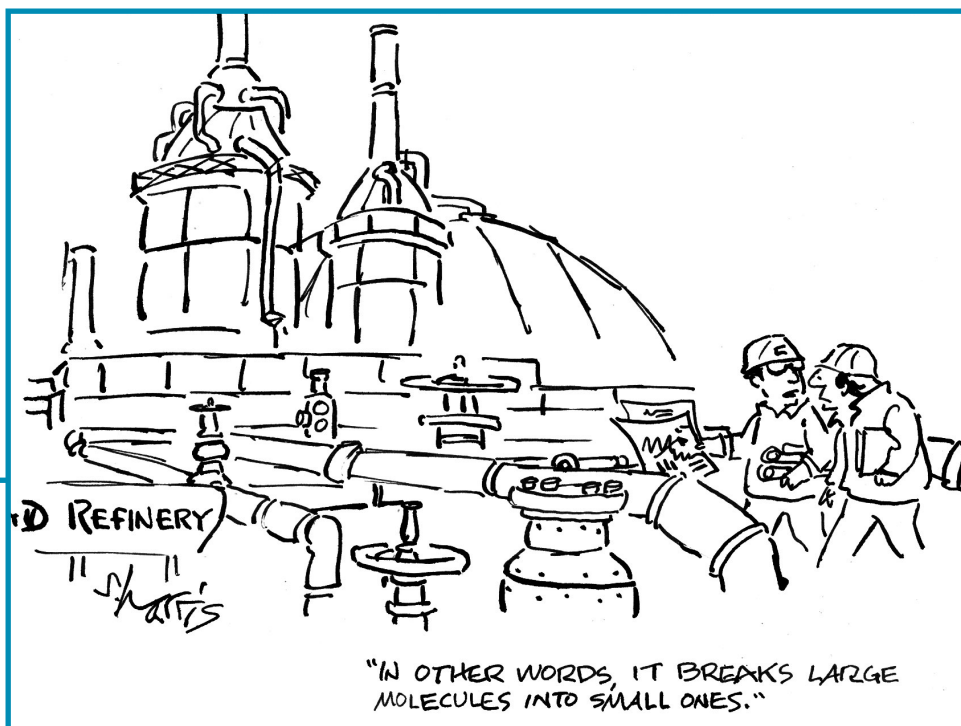
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SIDNEY HARRIS CARTOON

Funded by the ACS Innovative Grant Program and hosted by the Division of History of Chemistry, eminent cartoonist Sidney Harris has agreed to provide 12 previously unpublished cartoons to ACS Local Sections for use in their news-letters and web pages beginning in January 2019. Many of his cartoons are available in the book "EUREKA! DETAILS TO FOLLOW - Cartoons on Chemistry" (2018), Sidney Harris Publisher.



All chemists know that refineries really separate mixtures of molecules into highly purified versions of oil, sugar, natural gas, etc., on a scale that is suitable for society-wide consumption.

However, the public's image of chemistry is too often associated with industrial refineries, and the accompanying smoke stacks, sulfurous smells and, more recently, the impact of CO₂ and methane on climate change. Perhaps the refineries for the future will be images of CO₂ removal and mineralization, or the cleansing of drinking water on a global scale. From a Scotsman's perspective, however, my favorite refinery will always be the Glenfarclas distillery in Speyside Scotland — sustainable, beautiful and one of the greatest man-made products on earth.

~ David MacMillan – Princeton University

From the Editor's Desk



Dear Readers,

My thanks for their contributions to this issue go to Irene Cesa, Paul Brandt, Sherri Rukes and the NCW - Chemistry Day team, Tim Marin, Sam Kean, Sidney Harris, Andrea Twiss-Brooks, Vince Hradil, as well as to Helen Dickinson and Ken Fivizzani for their assistance in proofreading.

In synchrony with UNESCO's designation of 2019 as the International Year of the Periodic Table of Chemical Elements, marking the 150th anniversary of the periodic system introduced by Mendeleev in 1869, you will find in this issue an historical piece about a helix-shaped "table" of the elements, proposed by W. D. Harkins and originally published in *The Chicago Chemical Bulletin* in 1915. For more information on "IYPT" go to <https://iypt2019.org>

Speaking of the periodic table, some readers may be familiar with a song called "The Elements", written by Tom Lehrer in 1959.



United Nations
Educational, Scientific and
Cultural Organization



International Year
of the Periodic Table
of Chemical Elements

Image credit: <https://www.acs.org/content/acs/en/education/whatischemistry/periodictable.html>

This humorous ditty recites all 102 elements up to nobelium known at the time of writing. Because alliteration is featured prominently ("There's antimony, arsenic, aluminum, selenium...") the elements are not listed in their usual order. Lehrer drew inspiration from a song written by Ira Gershwin which listed fifty Russian composers in a similar manner (Wikipedia).

Enjoy this issue of the Bulletin! ~ M.E.S.~

Celebrating the International Year of The Periodic Table

The following is an abbreviated version of an abstract by William Draper Harkins published in the October 1915 issue of *The Chicago Chemical Bulletin*. It appears to correspond to a paper published in the *Journal of the American Chemical Society* in February 1916.

THE PERIODIC SYSTEM.

(Abstract of a Paper by W. D. Harkins)

The periodic system is the most important generalization of the facts embodied in the science of chemistry, but its study was neglected for more than a decade on account of the influence of some of the members of the so-called thermodynamic school of chemists, led by Ostwald, who used his influence to suppress as much as possible the use of the atomic theory. Recent remarkable discoveries made by physicists have, however, made it evident that the atomic theory and the periodic system are of supreme importance in both chemistry and physics.

The total number of elements up to and including uranium, is 92. Of these 87 have already been discovered and 5 are still unknown. Of these 5, three belong to the seventh group, 2 being in VIIB, and these may be given the provisional names eka-manganese 1 (atomic weight about 99), and eka-manganese 2 (At. Wt. about 188).

In addition to these 92 elements of the ordinary system, Nicholson assumes that there is another system of simpler elements such as protohydrogen, nebium, protofluorine (coronium), and arconium, of atomic weights 0.082; 1.31; 2.1; and 2.9. Of these elements the spectra of nebium and arconium are found in the nebulae, and that of protofluorine (coronium) is found in the corona of the sun.

It has been found that the number of the element in the periodic table beginning with hydrogen as 1, helium, 2, lithium, 3, etc.; or what is called the **atomic number** is more characteristic of an element than its atomic weight.

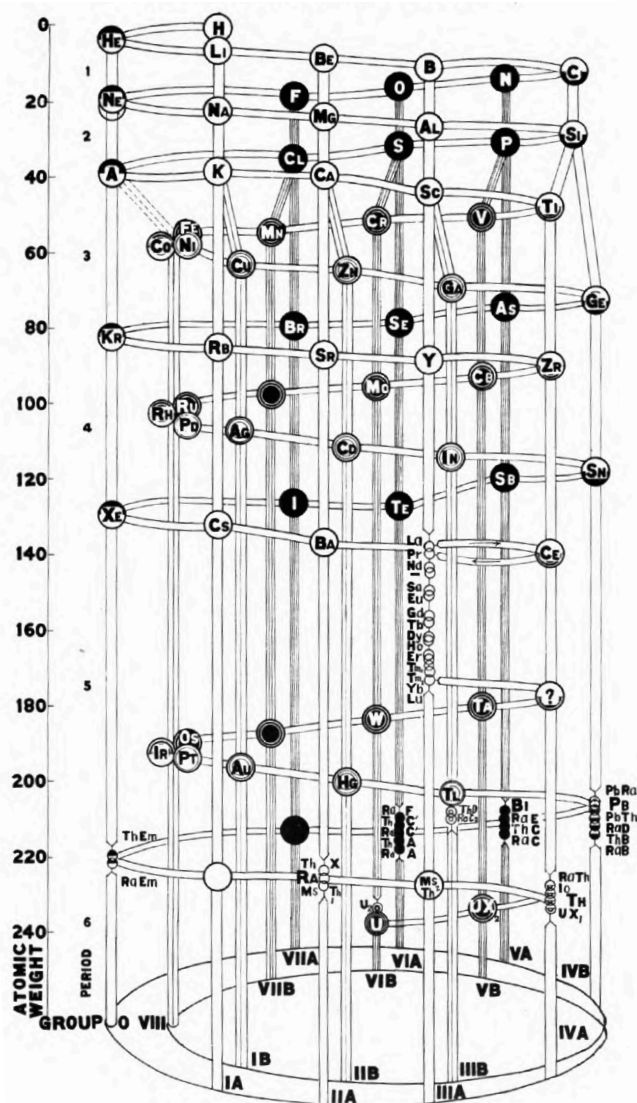
The periodic table of Mendeleef classified the elements as well as was possible at the time when it was devised, and practically none of the more recent tables have made any improvement upon the original form, but the discoveries of the last few years have made it possible to design a table which expresses the relations existing between the elements more perfectly. A modern table should:

- (1) Plot the atomic weights directly so that the isotopes of an element may be included.
- (2) It should give no blanks, except those corresponding to atomic numbers of elements which remain to be discovered. The Mendeleef table contains many blanks which can never be filled.
- (3) It should in a natural way relate such a sub-group as the Zn, Cd, and Hg group to the corresponding main group (Be, Mg, Ca, Sr, Ba, Ra).
- (4) These relations should be shown by a continuous curve. In the ordinary form of a table there is nothing to indicate the relation of one series to the next.

A modern table which meets these requirements may be constructed as a helix in space or a spiral on a plane. The space form is more nearly like the ordinary table and is therefore to be preferred. The accompanying figure is a vertical projection of such a space model, while the base is given in perspective so that the table may be more easily visualized.

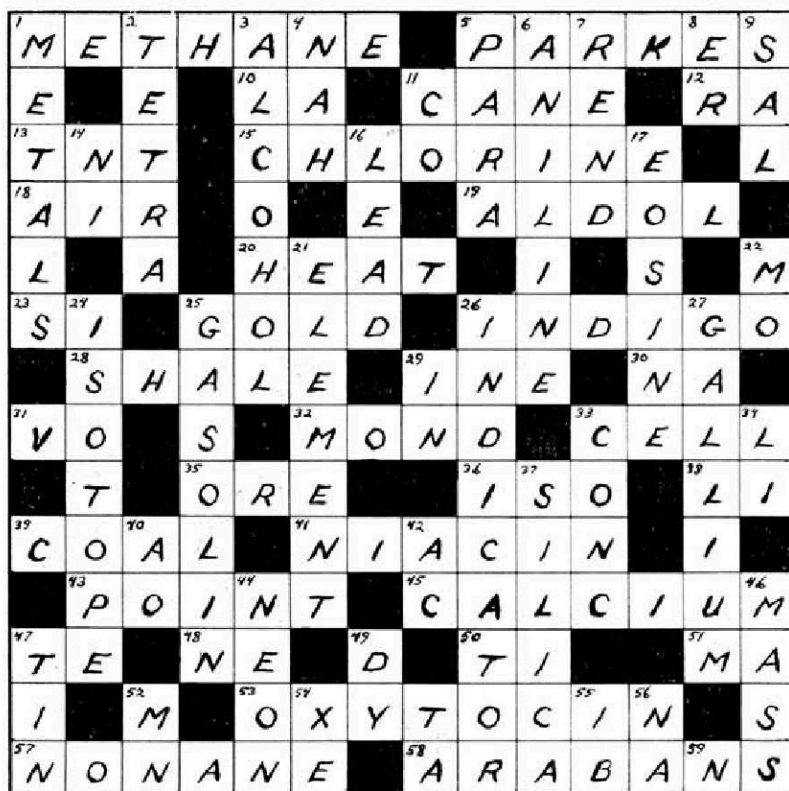
The balls representing the elements are supposed to be strung on vertical rods. All of the elements on one vertical rod belong to one group, and have, on the whole, the same maximum valence. The group numbers are given at the bottom of the rods.

An interesting question concerns the validity of the law of the conservation of matter for the change of one atom into another. The loss of weight in a radioactive change is probably larger than the weight of the particles lost. Thus when radium changes into the form of lead which comes from radium, the radium loses 5 alpha particles with a weight of 20.00 units, but the loss of mass may be calculated as about 0.03 units greater than this. This amount of mass seems to be lost in the form of energy. Looked at in this way what we conceive of as mass seems to be energy which is in a manner highly concentrated in a certain space.



PERIODIC TABLE BY W. D. HARKINS.

Solution to the Chemical Crossword Puzzle
on page 11 of the October 2019 issue



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ENJOY THIS GEM FROM THE JAN 1956 ISSUE

EDITOR'S NOTE

DR. R. E. SCHAAD has inquired of us as to the meaning of the term "Hydrobon" which was referred to on page 28 of the December BULLETIN. One authority on these matters has stated that it is the result of hydrogenolytic fission of a bon-bon bond. We hope that this may clear up any misunderstandings that may have arisen, except possibly in the confectionery industry. J.H.P.

Bulletin Information

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ChemShorts For Kids

The Alka Seltzer Challenge

As you may know, Alka Seltzer is a substance that can soothe an uneasy tummy. Oftentimes if you have eaten too much your stomach can produce too much acid which can make you feel not so good. Alka Seltzer contains sodium bicarbonate which can react with that extra acid to neutralize it – and it may give you the burps as well because the reaction creates carbon dioxide gas which will want to escape from your body. We are going to take a look at this reaction in action and see what else can affect the reaction.

Materials:

- Alka Seltzer tablets (or generic brand antacid tablets)
- Vinegar
- Water
- A film canister
- A knife for scoring tablets
- Watch or clock with a second hand
- Ice
- Heat source (microwave or stove)



Safety Considerations:

EYE PROTECTION IS REQUIRED FOR THIS EXPERIMENT. Expect the lid of the canister to be a projectile and that the vinegar may come out of the canister as well. Protective eyewear is recommended and the use of gloves may also be warranted particularly if there are any open abrasions that the vinegar can interact with. If the canister is tipped upside down this will certainly cause a mess as the liquid will spill all over. Adult supervision is strongly recommended.

Experiment:

We will try multiple experiments where we vary the concentration of the vinegar and then a series of experiments where we vary the temperature. Cut two Alka Seltzer tablets into 8 equal sized tablets. We will do a control to start with by using just water. Take the top of the vinegar container off and fill the cap five times with water, emptying the water each time into the empty film canister. As soon as you drop the ¼ sized tablet into the canister with the water, cap the canister and begin timing how long it takes for the lid to blow off the top. In the second trial, put 1 capful of vinegar and 4 capfuls of water into the canister and repeat the experiment.

After that, try 3 capfuls of vinegar and 2 capfuls of water and in the last experiment, try 5 capfuls of vinegar. These were all done at room temperature so in other experiments, you can try cooling one of your experiments from above (pick one that gave a reasonable time frame) by placing the solution on ice for a while. You can also try heating the solution as well to see how that affects the time it takes for the cap to blow off.

What's happening?

Sodium bicarbonate, NaHCO_3 , will react with acid, H^+ , to create water (H_2O), Na^+ , and CO_2 as seen here:



The CO_2 is a gas and this will build up and create enough pressure to blow the top off of the canister. By increasing the amount of H^+ in the canister, it will make the reaction go faster causing the lid to blow off sooner. This is because you are causing more H^+ to collide with the baking soda. And, vinegar is a good source of H^+ . Water does not contain much H^+ , so Alka Seltzer puts an acid (citric acid) into the tablet so that when

it dissolves into the water it can react with the NaHCO_3 . We also find that the hotter the temperature, the faster the reaction will go as well. This is because you are making the molecules move faster so that more collisions happen in the same period of time causing the reaction to go faster. You could do another experiment and see if a crushed tablet will go even faster!

Additionally, if you want a little more excitement, try turning the canister upside down! This will cause the canister to be a rocket instead of the lid. You may want to do this outside though where messes aren't such a big deal. Remember to use protective eyewear!

References:

- http://biocircuits.ucsd.edu/outreach/?category_name=Experiments&paged=2
- <https://www.youtube.com/watch?v=nsayFUSwKfs&feature=youtu.be>

To view all past "ChemShorts for Kids", go to: http://chicagoacs.org/articles/article_category/1

Paul Brandt

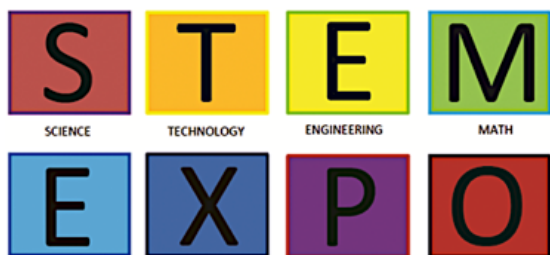
N	C	W		Ac	Ti	V	I	Ti	Es
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This year's **Chemistry Day**, a part of **ACS National Chemistry Week (NCW)**, took place at Northwestern University's Technological Institute on Saturday, October 19 from 10:00 AM to 3:00 PM. Focusing on the theme of "*Marvelous Metals*", the event featured a variety of presentations, hands-on activities, and tours of Northwestern's chemistry facilities. Thanks to Chicago Section members Sherri Rukes and her team for coordinating the event and to Tim Marin for sharing these images.



Individuals are listed left to right in each photo. *Top-left photo:* Sherri Rukes, Ilana Lemberger, Avrom Litin, and Laeh Litin. *Top-right:* "It's just like cooking!", Milt Levenberg at far right. *Right:* Mentor and mentee for a day. *Bottom-right:* Young chemists working on a Periodic Table jigsaw puzzle with Margy Levenberg (at right). *Bottom-left:* David Crumrine and family members Rowan, Paul, Maeve and Kelly Crumrine. N.B. - All persons shown in lab settings are wearing eye protection.





November 8, 2019 @ 5:30 pm - 9:00 pm

Hubble Middle School, 3S600 Herrick Road,
Warrenville, IL 60555

<http://studentexcellencefoundation.org/event/stem-expo-2019/>

Bring the family out for a fun night of STEM activities!

Students will have the opportunity participate in hands-on STEM experiments. We are collaborating with the [Wheaton-Warrenville Special Needs PTA](#) to open the exhibits at 5:30 pm for **families with children with special needs** to attend and explore. The quieter exhibits will be in the commons area as well as the large gym. Robotics will be in the small gym. The STEM Expo will open to the general public at 6:00 pm. Suggested contribution \$5 per participant.



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UPCOMING ACS SECTION EVENTS

WEDNESDAY, NOVEMBER 20 - Monthly Meeting

5:30 p.m. - 9:00 p.m. - details in this issue

Presentation by Author Sam Kean - **NOTE CHANGE OF LOCATION**

Joint Meeting with the Joliet Section to be held at Concordia University / River Forest

FRIDAY, DECEMBER 13 - Monthly Meeting

Holiday Meeting on Chocolate Science & Technology to be held at Benedictine University
Interactive Presentation by Melissa Tisonchik, Director of R&D at Blommer Chocolate Co.

OTHER EVENTS

NOVEMBER 8 - STEM EXPO (see details above)

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