

The Chemical Bulletin

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MAY • 2017

**THE ONE HUNDRED AND SIXTH PRESENTATION OF THE
WILLARD GIBBS MEDAL
(FOUNDED BY WILLIAM A. CONVERSE)
TO
PROFESSOR JUDITH KLINMAN
sponsored by the
CHICAGO SECTION
of the
AMERICAN CHEMICAL SOCIETY
FRIDAY, MAY 19, 2017**

Meridian Banquets
1701 Algonquin Road
Rolling Meadows, IL 60008
847-952-8181

ON-SITE PARKING: Free

RECEPTION WITH HORS D'OEUVRES 6:00 - 7:00 P.M.
(with two complimentary drinks)

DINNER 7:00 - 8:30 P.M.

ACS AWARD CEREMONY 8:30 - 8:45 P.M.

- A History of the Willard Gibbs Award by Fran Kravitz, Chicago Section Chair
- Introduction of Professor Klinman by Brian Hoffman, Northwestern University
- Presentation of the Gibbs Medal by Peter Dorhout, President-Elect of the American Chemical Society

GIBBS AWARD LECTURE BY PROFESSOR KLINMAN 8:45 – 9:45 P.M.

NETWORKING 9:45 P.M. –



Dr. Judith Klinman

Dr. Judith Klinman, Joel Henry Hildebrand Distinguished Professor, Professor of Chemistry and of Molecular and Cell Biology, University of California - Berkeley

“C-H activation, quantum tunneling, and new ways of looking at enzyme catalysis”

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LOCAL TEACHER IN THE NEWS

The Citation – For ground breaking discoveries in enzyme catalysis which:

- Pioneered the application of kinetic isotope effects to the study of enzyme catalysis and mechanism.
- Demonstrated how proteins containing TPQ generate their own cofactors performing two different catalytic roles of biogenesis and catalysis.
- Launched the field of protein derived cofactor that mediates enzyme activity.
- Demonstrated anomalies in kinetic studies that led to the discovery that protein structures have evolved to catalyze effective quantum mechanical tunneling.

ABSTRACT

Our ability to understand and design potent catalysts lies squarely at the interface of biology and chemistry. In particular, the enormous rate accelerations of enzyme catalyzed reactions make them ideal subjects for advancing this topic. Yet, despite over half a century of inquiry, *de novo* design has failed to produce new enzyme catalysts that approximate the properties seen in nature. This talk will focus on emergent properties that necessitate the incorporation of QM tunneling and protein motions as a central paradigm in enzyme function.

The Chicago Section's
e-mail address
is
chicagoacs@ameritech.net



A recent "CHEMISTRY in PICTURES" was posted to c&en, http://cen.chempics.org/?utm_source=Newsletter&utm_medium=Newsletter&utm_campaign=CEN. JulieAnn Villa and her student Tammy Dang at Niles West High School in Skokie, Ill., sent in pictures of unique bubbles made from pipe cleaner and straw models to generate their shapes. This led to conversations on orbitals. Congratulations to Ms. Villa on receiving the 2017 Illinois Chemical Education Foundation Davidson Award as the outstanding high school chemistry teacher!

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BIOGRAPHY:

Dr. Klinman received her A.B. and Ph. D. from the University of Pennsylvania in 1962 and 1966 and then carried out postdoctoral research with Dr. David Samuel at the Weizmann Institute of Science, Israel, and Dr. Irwin Rose at the Institute for Cancer Research, Philadelphia. She was an independent researcher at the Institute for Cancer Research for several years, before moving to the University of California at Berkeley in 1978, where she is now a Professor of the Graduate School in the Department of Chemistry, the Department of Molecular and Cell Biology, and the California Institute for Quantitative Biosciences (QB3).

Dr. Klinman has been focused on understanding the fundamental properties that underlie enzyme catalysis. Early in her career, she developed the application of kinetic isotope effects to the study of enzyme catalysis. In 1990, she demonstrated the presence of the neurotoxin, 6-hydroxydopa quinone (referred to as TPQ), at the active site of a copper-containing amine oxidase from bovine plasma, overcoming years of incorrect speculation regarding the nature of the active site structure and opening up the field of protein-derived quino-cofactors. Subsequent work from her group showed that the extracellular protein lysyl oxidase, responsible for collagen and elastin cross-linking, contains a lysine cross-linked variant of TPQ, while mechanistic probes advanced knowledge of cofactor biogenesis and catalysis in the copper amine oxidases. Most recent work is focused on unraveling the enigmatic pathway for production of the free-standing bacterial cofactor/vitamin, pyrroloquinoline quinone.

Since the 1990s, Klinman's kinetic studies of enzyme reactions have demonstrated anomalies that demonstrate quantum mechanical hydrogen tunneling in enzyme-catalyzed hydrogen activation reactions. These findings indicate that proteins influence rate by modulating barrier width, not simply barrier height. Because the transfer of hydrogen as a wave requires restructuring of the heavy atom environment, her tunneling studies also provide a direct link between motions within a protein and the bond making/bond breaking processes that they catalyze. Many of the redox enzymes that have been pursued in the Klinman laboratory use molecular oxygen as substrate. She has developed a set of experimental probes for determining the mechanism of oxygen activation. These probes are able to shed light on how proteins can reductively activate O_2 to free radical intermediates, while avoiding oxidative damage to themselves. Her most recent investigations are directed at expanding the principles uncovered from hydrogen transfer processes to other classes of enzyme reaction that include the large class of methyltransferases as well as the TIM barrel superfamily.

WILLARD GIBBS AWARD

The **Willard Gibbs Award**, has been presented by the Chicago Section of the American Chemical Society since 1910. It was founded by William A. Converse (1862-1940), a former Chairman and Secretary of the Chicago Section and named for Professor Josiah Willard Gibbs (1839-1903) of Yale University. Gibbs, whose work with Maxwell and Boltzmann developed the field of Statistical Mechanics and is known to millions of undergraduates for Gibbs Free Energy (developed in 1933), as he solved the question of the maximum amount of work that can be done by a system on the universe during a change in state of the system ($\Delta G_{\text{sys}} = -T\Delta S_{\text{univ}}$) and ultimately the more familiar $\Delta G = \Delta H - T\Delta S$.

The purpose of the award is "To publicly recognize eminent chemists who, through years of application and devotion, have brought to the world developments that enable everyone to live more comfortably and to understand this world better." Gibbs was chosen to be the model for the award as an outstanding example of creativity in scientific investigation. Medalists are selected by a national jury of twelve eminent chemists from different disciplines elected by the Chicago Section ACS Board. The nominee must be a chemist who, because of the preeminence of their work in and contribution to pure or applied chemistry, is deemed worthy of special recognition.

Mr. Converse supported the award personally for a number of years, and then established a fund for it in 1934 that had subsequently been supported by the Dearborn Division of W.R. Grace & Co. Considerable contributions to the award have also been made by J. Fred Wilkes and his wife. The award consists of an eighteen-carat gold medal having, on one side, the bust of J. Willard Gibbs, for whom the medal was named. On the reverse is a laurel wreath and an inscription containing the recipient's name.

Most of the awardees that you see below are familiar to chemists regardless of specialty. This fame may result from later recognition, including, in many cases, the Nobel Prize, or the reason may be that textbooks have permanently associated many of these names with classic reactions or theories.

PAUL BRANDT

- 1911 Svante Arrhenius
- 1912 Theodore William Richards
- 1913 Leo H. Baekeland
- 1914 Ira Remsen
- 1915 Arthur Amos Noyes
- 1916 Willis R. Whitney
- 1917 Edward W. Morley
- 1918 William M. Burton

- 1919 William A. Noyes
- 1920 F. G. Cottrell
- 1921 Mme. Marie Curie
- 1922 no award
- 1923 Julius Stieglitz
- 1924 Gilbert N. Lewis
- 1925 Moses Gomberg
- 1926 Sir James Colquhoun Irvine
- 1927 John Jacob Abel
- 1928 William Draper Harkins
- 1929 Claude Silbert Hudson
- 1930 Irving Langmuir
- 1931 Phoebus A. Levene
- 1932 Edward Curtis Franklin
- 1933 Richard Willstätter
- 1934 Harold Clayton Urey
- 1935 Charles August Kraus
- 1936 Roger Adams
- 1937 Herbert Newby McCoy
- 1938 Robert R. Williams
- 1939 Donald Dexter Van Slyke
- 1940 Vladimir Ipatieff
- 1941 Edward A. Doisy
- 1942 Thomas Midgley, Jr.
- 1943 Conrad A. Elvehjem
- 1944 George O. Curme, Jr.
- 1945 Frank C. Whitmore
- 1946 Linus Pauling
- 1947 Wendell M. Stanley
- 1948 Carl F. Cori
- 1949 Peter J. W. Debye
- 1950 Carl S. Marvel
- 1951 William Francis GIAUQUE
- 1952 William C. Rose
- 1953 Joel H. Hildebrand
- 1954 Elmer K. Bolton
- 1955 Farrington Daniels
- 1956 Vincent du Vigneaud
- 1957 W. Albert Noyes, Jr.
- 1958 Willard F. Libby
- 1959 Hermann I. Schlesinger
- 1960 George B. Kistiakowsky
- 1961 Louis Plack Hammett
- 1962 Lars Onsager
- 1963 Paul D. Bartlett
- 1964 Izaak M. Kolthoff
- 1965 Robert S. Mulliken
- 1966 Glenn T. Seaborg
- 1967 Robert Burns Woodward
- 1968 Henry Eyring
- 1969 Gerhard Herzberg
- 1970 Frank H. Westheimer
- 1971 Henry Taube
- 1972 John T. Edsall
- 1973 Paul John Flory

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- 1974 Har Gobind Khorana
- 1975 Herman F. Mark
- 1976 Kenneth S. Pitzer
- 1977 Melvin Calvin
- 1978 W. O. Baker
- 1979 E. Bright Wilson
- 1980 Frank Albert Cotton
- 1981 Bert Lester Vallee
- 1982 Gilbert Stork
- 1983 John D. Roberts
- 1984 Elias J. Corey
- 1985 Donald J. Cram
- 1986 Jack Halpern
- 1987 Allen J. Bard
- 1988 Rudolph A. Marcus
- 1989 Richard B. Bernstein
- 1990 Richard N. Zare
- 1991 Günther Wilke
- 1992 Harry B. Gray
- 1993 Peter B. Dervan
- 1994 M. Frederick Hawthorne
- 1995 Sir John Meurig Thomas
- 1996 Fred Basolo
- 1997 Carl Djerassi
- 1998 Mario J. Molina
- 1999 Lawrence F. Dahl
- 2000 Nicholas Turro
- 2001 Tobin J. Marks
- 2002 Ralph Hirschmann
- 2003 John I. Brauman
- 2004 Ronald Breslow
- 2005 David A. Evans
- 2006 Jacqueline K. Barton
- 2007 Sylvia T. Ceyer
- 2008 Carolyn R. Bertozzi
- 2009 Louis Brus
- 2010 Maurice Brookhart
- 2011 Robert G. Bergman
- 2012 Mark A. Ratner
- 2013 Charles M. Lieber
- 2014 John E. Bercaw
- 2015 John F. Hartwig
- 2016 Laura Kiessling



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!!!!!!!!!!!! CELEBRATION OF THE GIBBS AWARD !!!!!!!!!!!!!

Do you know about the 106th J. Willard Gibbs Award Dinner on Friday, May 19, 2017 at Meridian Banquets, Rolling Meadows?

For just \$ 50, you get the following:

- an internationally renowned chemist, Judith Klinman of University of California, Berkeley, 2017 Gibbs Award Winner, giving a talk about her fascinating research
- a great dinner including appetizers, wine, and 2 complimentary drinks!
- the opportunity to network with chemists excited about meeting you

Join us for a social hour that begins at 6 PM (with hors-d'oeuvres and 2 complimentary drinks), dinner at 7 PM, and Dr. Klinman's talk beginning at approximately 8:30 pm.

**Dinner Menu includes
Cream of Tomato Basil Bisque with Bleu Cheese
Meridian Salad**

**WITH A CHOICE OF
Roast Top Sirloin of Beef with rosemary merlot sauce
Fresh Broiled Norwegian Salmon with dill sauce
Portobello Mushroom with zucchini**

Hot Fudge Brownie à la mode

Reservations are required. Please register at our website (www.chicagoacs.org) or call the Chicago Section office at 847-391-9091 by Monday, May 15 and pay \$50 at the door. No cancellations can be made after noon on Monday, May 15, 2017.

Please come to salute the recipient and rejoice in Dr. Klinman's achievements and her contributions to the science of Chemistry. Prior award winners include Svante Arrhenius, Marie Curie, Linus Pauling and other top chemists of the 20th and 21st centuries. Join us for this gala event!

After all, where else can you hear a great chemist
AND get a fudge brownie?

SOMEONE YOU SHOULD KNOW

The subject of my column this month is **Herbert Golinkin**. I have known Herb for as many years as I have been a member in the Chicago Section. Herb appointed me to my very first volunteer position with the Section when the 1987 National meeting was in Chicago. Herb has always been a champion of the Section. There is not one fact that Herb does not know about the Section and I am proud to call him a dear friend. Dr. Golinkin is currently the Comptroller for the Chicago Section and is a member of the National ACS Senior Chemist Committee and a National ACS Career Consultant. Herb was Chair of the Chicago Section twice from 1984-1985 and 2001-2002.

Herb was born in Chicago and has one sister. His father and mother owned a children's store. He was the first in his family to go into science. Dr. Golinkin has always been interested in science but his true passion came from a television program that DuPont produced when he was very young. The experiment that hooked him was on color change reactions. He went on to earn his B.A. in chemistry from Johns Hopkins University in 1961. Herb earned his Ph.D. in chemistry at the University of Alberta which is now the University of Calgary in 1966. His dissertation was titled "Piezochemistry of Reactions in Solution" under Professor James B. Hyne who was Dean of Graduate Studies and the Department Chair. He told me that if he did not become a chemist he would have either been a lawyer, physician, or an accountant. We are certainly glad he chose chemistry.

Dr. Golinkin has had a very rich career as a chemist. He began his career as a Postdoctoral Fellow in 1966 for the National Research Council of Canada, performing research on reactions in aqueous media. In 1968, he became a Visiting Assistant Professor of Chemistry at the University of Minnesota teaching general chemistry, physical chemistry and chemistry for non-chemistry students. Herb left academia in 1970 to join Amoco Chemical Company as a Research Chemist developing high performance polymers, coatings and oil field production chemicals. He was promoted to Staff Research Chemist in 1975 and then in 1978 moved to Amoco Petroleum Additives Company developing lubricants and their additives. Herb joined Columbia College as an Adjunct Professor in 1993 and lectured on ethics for scientific reporting. Dr. Golinkin went on to Illinois Tool Works in 1993 as a Research Associate developing materials and applications for 400 subsidiary companies related to railroad tracks, materi-

als transport, and welding applications. He remained at Illinois Tool Works until 2000. His final position was at College of DuPage as an Adjunct Professor of Chemistry in 2002 and he taught general chemistry until 2006.

Herb joined the ACS after receiving his B.A. degree. There was no one person who convinced him to join, but the ACS was always present in some manner during his undergraduate years. He also joined the Chemical Institute of Canada, which is analogous to the ACS, because he earned his Ph.D. in Canada and did his post-doc there. Dr. Golinkin became active in the Chicago Section in 1974 working on the House and Gibbs Arrangement Committees. He has held almost every role the Chicago Section has to offer including Chair, Vice-Chair, and Director just to name a few. Herb was the first person to start the Job Club and he wrote a manual which was later used by National ACS in their Career program. Dr. Golinkin has also served National ACS as a Chicago Section Councilor, on the Committee on Constitution and By-Laws and on the Committee on Local Section Activities besides his current positions.

Dr. Golinkin has also had a very full life outside of chemistry. He was married 64 years to his wife, Adrienne, who passed away in 2015. They met during their last year of high school and married after he completed his undergraduate degree. He has two wonderful children, Selena, who studied music and accounting and his son, Norman, who studied architecture and is a structural engineer. He enjoys woodworking and gardening but also is interested in history and religion. Most people don't know about his other outside volunteer activities which include Junior Achievement Advisor from 1975 to 1977; Naperville Food Pantry: Home Bound Delivery, 2003-Present and Warehouse Operations, 2003 and 2006; Public Action to Deliver Shelter, 2003-Present; and Congregation Beth Shalom: Founder in 2002, and President from 2006-2008.

Herb's final words of wisdom to us are: "I often have been asked "Why should I join the ACS?" The usual reason people give is that the ACS offers much to the individual member. There are discounts on publications and continuing education courses, as well as automobile rentals, etc. There are savings on various types of insurance including the ability to maintain these when changing employers. All of these are valuable and taking advantage of only a few can save a member more than the cost of membership. If you only want a job that is eight-hours a day, five days a week, that would be sufficient. But if you want a career, and consider yourself a professional, there is much more. Being a member of the

ACS provides the opportunity to network with scientists from around the world at various scientific meetings. Face-to-face contact is much more fruitful than Facebook contact. There are experienced scientists of all walks of life who can help with a plethora of knowledge from scientific endeavors to career paths. As a chemist who received a bachelors degree from an accredited institution, you benefited from generations of chemists who went before you. They are the members of the ACS who ensured that the programs at your college or university had the proper courses with the proper content. They were instrumental in accrediting the institution from which you graduated. Their only reward is the satisfaction knowing that future generations would be well equipped for their careers. The fading of boundaries among the subjects of chemistry over the past years has resulted in the need for different courses to be developed within the same institutions that you attended. These disciplines you were subjected to are, or will become, somewhat obsolete as isolated subjects. By being a member of the American Chemical Society you will have the opportunity to help develop the new courses that are, and will be, required. Just as those who went before you provided for your education, you will have the opportunity to give back to your profession by helping to provide the basic knowledge that the current and future generations will need. The satisfaction obtained in this endeavor cannot be described. The American Chemical Society is not merely a club, it is a Society of professionals working together for the benefit of the science, its practitioners, and the general public."

Fran Kravitz

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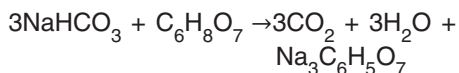
"CHEM SHORTS" For Kids

Bath Bombs

What is a bath bomb and why does it fizz when it goes into water? A bath bomb is a solid, powdery substance which can take many shapes. Here is one pictured below.



As it's submerged in water, it bubbles. This is the result of the release of CO₂ also known as carbon dioxide. This is the gas you breathe out. The release of this gas occurs because of an acid-base reaction. Although we tend to think of acids as scary, many foods we eat are acidic, such as lemons or tomatoes. The acid and base found in a bath bomb are weak and will not hurt your skin. Here is the balanced equation:



Sodium bicarbonate (NaHCO₃), also known as baking soda, reacts with citric acid (C₆H₈O₇). In the foods you eat, citric acid is often used as a preservative or as a flavoring agent. Baking soda would be considered the base in this reaction. You can guess that the citric acid is, of course, the acidic component. The products (what forms at the end of the reaction) are carbon dioxide, water, and sodium citrate. Sodium citrate (Na₃C₆H₅O₇) is also commonly found in the foods you eat.

You might be wondering, how can these ingredients be together in a bath bomb and not react until water comes into the picture? Chemicals are often most stable as a solid. Therefore, water allows the acid and base to react with each other.

Bath bombs are cheap and easy to make. All of the ingredients are safe to handle which makes it fun for people of all ages! Here is an ingredient list and procedure on how to make them:

- 1 cup of baking soda (sodium bicarbonate)
- 1 cup of citric acid
- 1/2 cup of coconut oil

- 1/4 cup corn starch
- 1/4 cup of Epsom salts (magnesium sulfate)
- A few drops of the desired color or dye
- A few drops of desired fragrance

- Mix the dry ingredients in the bowl
- Melt the oil if necessary and add fragrance and dye to the oil.
- Mix everything together and use 2" spherical molds or make your own mold
- Be sure to pack the ingredients tightly to yield approximately 10 bath bombs
- Let sit for 24 hours

Oil is necessary to help bind the ingredients together. This also helps moisturize your skin. If you have allergies to coconut oil, it can be substituted using ingredients such as almond oil, sunflower oil, or shea butter. The cornstarch and Epsom salts prevent excess moisture from activating the acid-base reaction.

If proper soap dye is used, there should not be any bath stains. Food coloring can work as well. Essential oils or spritz of fragrances can help scent the bath bombs. As a note, citric acid can often be found at local grocery stores in the spice aisle. Also, to form the bath bombs, soap molds can be purchased at arts and crafts stores.

If you happen to use a bath bomb, don't forget to still use soap in your bath since this is not a soap-containing product! Due to the product being a solid, it will last a long time if kept in a dry area. Bath bombs are exciting to make and use, and you can even make them as a gift for someone. Experiment with different quantities of ingredients and see how it affects the bomb. Have fun and play around as a formulating chemist!

Amanda Rountree
North Central College

REPORT OF COUNCIL MEETING HELD IN THE SPRING OF 2017

The 253rd National Meeting of the ACS was held in San Francisco, CA, from April 1 – 6, 2017. The theme of this meeting was "Advanced Materials, Technologies, Systems and Processes." The Chicago section was represented at Council by our complete contingent of councilors: Charles Cannon (Local Section Activities), David Crumrine (Constitution and Bylaws), Ken Fivizzani (Community Activities), Russell Johnson (Chemistry and Public Affairs), Michael Kohler (Chemical Safety), Margy Levenberg (Meetings and Expositions), Milt Levenberg (Senior Chemists), Inessa Miller, Barbara Moriarty (Ethics) and Susan Shih (Education). The national activities of each are given, as I know them.

Finances: The Committee on Budget and Finance reported that the Society ended 2016 with \$526.8 million in total revenue, which was \$15 million more than in 2015. The total expenses ended the year at 503.0 million, which was 1.6% higher than the previous year. The unrestricted net assets for the society increased to \$206.5 million and is still out of compliance with Board-established financial guidelines.

Governance: The Council elected Bonnie A. Charpentier and Willie E. May, to be candidates for President- Elect of the society. The election, along with any petition candidates, will be held in the fall of 2017. Our own Kenneth P. Fivizzani is a candidate for Director-at-Large.

Meetings and Expositions: As of April 4, 2017, the 253rd ACS national meeting had attracted 18,850 registrants, including 9797 regular attendees and 6914 student attendees. In addition, it was reported that there were 14,639 scientific contributions at this meeting. The number of attendees is a record for SF.

Membership Affairs: At the end of 2016, membership was 156,129, which is 0.5% less than on the same date in 2015; this includes 27,388 international members. The cost of membership was increased at the fully escalated rate to \$171 for 2018.

Committee on Economic and Professional Affairs: The career fair at the meeting had 459 job seekers, 32 employers and 145 jobs posted. The survey process will change because participation is very low. Instead a modular survey will be used.

Petitions: The Council voted against the "petition for Removal of Officers and Councilors" which sought to allow the removal of Councilors and Alternate Councilors by a petition of five members of the unit represented. The Council voted to approve the "petition on the rights of affiliates."

Special Discussion Item: A special discussion topic, "ACS Yesterday and Today: Paving the Way to Tomorrow" was conducted to gather input for the Joint Board-CPC Task Force on Governance Design. The task force offered three questions to guide the discussion: What should the Society and its governance do differently to achieve its objectives? If you could change one thing about ACS governance, what would it be? What should the task force leave "as is"?

(continued on page 7)

(continued from page 6)

If you have any questions and/or comments about the above actions, please contact me or one of your other councilors. You may contact me by email at barbaramoriarty0@gmail.com.

BARBARA MORIARTY

The mission of the Chicago Section of the ACS is to encourage the advancement of chemical sciences and their practitioners.

CALENDAR

May 6: The Marie S. Curie Girl Scout Chemistry Day program at College of Lake County, Grayslake

May 19: Chicago Section ACS Willard Gibbs Award Banquet. Dr. Judith Klinman, University of California, Berkeley, is the recipient of the 2017 Willard Gibbs Medal at Meridian Banquets in Rolling Meadows

May 20: Chicago Section Scholarship Exam at North Central College.

May 20: STEAM Conference, North-eastern Illinois University. <https://www.steamconf.org/>

June 8: The Japan America Society of Chicago 87th Anniversary Celebration Dinner, 6-9 pm at the Union League Club of Chicago featuring Dr. Ei-ichi Negishi of Purdue University. See details at <http://www.jaschicago.org/events/87th-anniversary-celebratory-dinner/>

June 13 -15: 21st Annual Green Chemistry & Engineering Conference "Making Our Way to a Sustainable Tomorrow", Reston, VA. <http://www.gcande.org/>

June 17: You Be The Chemist National Challenge

August 11-20: The Illinois State Fair in Springfield. Come volunteer at the ACS booth. <https://www.illinois.gov/statefair>

August 20-24: The 254th National ACS Meeting in Washington DC. The theme will be "Chemistry's Impact on the Global Economy." See details at <https://www.acs.org/content/acs/en/meetings/fall-2017.html>

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