American Chemical Society

DIVISION OF THE HISTORY OF CHEMISTRY

NEWSLETTER, PROGRAM & ABSTRACTS

259th ACS National Meeting
Philadelphia, PA
March 22-26, 2020

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Email: johnbsharkey@me.com
Mission Statement

The Division of the History of Chemistry (HIST) of the American Chemical Society (ACS) seeks to advance knowledge and appreciation of the history of the chemical sciences among chemists, students, historians of science, and the broader public by

- Encouraging research and scholarship in history of the chemical sciences;
- Providing a welcoming environment for the discussion of history of chemistry in a variety of venues, particularly in symposia at national ACS meetings;
- Serving as a resource for chemical scientists in general, and members of the ACS in particular, who seek to understand the roots of their discipline, sub-discipline, or interdisciplinary subject;
- Recognizing major achievements from the past in the chemical sciences and the individuals who made those achievements;
- Publishing a scholarly journal in history of chemistry;
- Interacting with other organizations interested in the history of science; and
- Adding value to the ACS by helping it achieve its vision and missions.

Division Governance

Message from the HIST Division Chair

The International Year of the Periodic Table (2019) is in the books now and we certainly contributed to the celebrations. The Fall 2019 National ACS meeting featured two excellent relevant symposia, namely “150 Years of the Periodic Table” and “150 Years since the Publication of the First Issue of the Journal of the Russian Chemical Society”. The Division is always seeking to increase its visibility and expand its membership, and one way to do that is by supporting HIST programming at regional ACS meetings. Accordingly, HIST sponsored well-attended symposia related to the periodic table at the 71st Southeastern Regional Meeting, held in Savannah, GA, in October, and at the joint Southwest & Rocky Mountain Regional Meeting in El Paso, TX, in November.

On a more personal level, one of the highlights of my first year as HIST Chair was representing the Division in a small ceremony organized by Gail Webster (Guilford College, Greensboro, NC) to honor Ted Benfey, recipient of the 2019 HIST Award for Outstanding Achievement in the History of Chemistry. It was a small but meaningful event, held on Saturday, October 26th, and attended by several of Ted's colleagues, the President of Guilford College, and two of his four children, among other friends and family of Ted. It was an honor to meet Ted in person for the first time, some 53 years after he served as HIST Chair! Here’s my favorite picture of Ted holding the award plaque.

In closing, I should mention that I recently attended the ACS Leadership Institute in Atlanta in January 2020 and I had rewarding interactions with other local section and technical division officers and ACS governance. Any ideas that increase the value of membership in HIST are always worth considering, and I learned some interesting strategies that may help us achieve that by using social media (Instagram, Twitter), to attract young(er) professionals to the Division. We do have an active Facebook page and an excellent website with plenty of resources, but that’s not how millennials are communicating these days. We must already be doing something right because I learned that HIST showed (by far) the largest percentual increase in membership among all 32 technical divisions during the past three years: from 675 in 2017 to 1122 in 2019 (a 66% increase!). Let’s all keep up the good work!

Daniel Rabinovich, HIST Chair
Actions of the Council

I. Elections

Election Results: Candidates for Service on Standing Committees


<table>
<thead>
<tr>
<th>Name</th>
<th>Votes</th>
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<tbody>
<tr>
<td>George M. Bodner</td>
<td>172</td>
</tr>
<tr>
<td>James C. Carver</td>
<td>177</td>
</tr>
<tr>
<td>*Dee Ann Casteel</td>
<td>183</td>
</tr>
<tr>
<td>Kenneth P. Fivizzani</td>
<td>136</td>
</tr>
<tr>
<td>*Anne M. Gaffney</td>
<td>201</td>
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<tr>
<td>Joseph A. Heppert</td>
<td>175</td>
</tr>
<tr>
<td>*Lydia E. M. Hines</td>
<td>199</td>
</tr>
<tr>
<td>*Will E. Lynch</td>
<td>222</td>
</tr>
<tr>
<td>*Sally B. Peters</td>
<td>235</td>
</tr>
<tr>
<td>Margaret J. Schooler</td>
<td>178</td>
</tr>
</tbody>
</table>

By electronic ballot, the Council elected Michelle V. Buchannan, Charles E. Cannon, Alan A. Hazari, Amber S. Hinkle, and Thomas H. Lane for three-year terms (2020-2022) on the Committee on Nominations and Elections (N&E).

<table>
<thead>
<tr>
<th>Name</th>
<th>Votes</th>
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<tbody>
<tr>
<td>V. Dean Adams</td>
<td>132</td>
</tr>
<tr>
<td>Mark A. Benvenuto</td>
<td>126</td>
</tr>
<tr>
<td>*Michelle V. Buchanan</td>
<td>212</td>
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<tr>
<td>*Charles E. Cannon</td>
<td>179</td>
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<tr>
<td>Alan B. Cooper</td>
<td>163</td>
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<tr>
<td>Alan M. Ehrlich</td>
<td>148</td>
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<tr>
<td>*Alan A. Hazari</td>
<td>198</td>
</tr>
<tr>
<td>*Amber S. Hinkle</td>
<td>302</td>
</tr>
<tr>
<td>*Thomas H. Lane</td>
<td>288</td>
</tr>
<tr>
<td>Joseph P. Stoner</td>
<td>119</td>
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</tbody>
</table>

By electronic ballot, the Council elected Lisa M. Balbes, D. Richard Cobb, Emilio X. Esposito, Jason E. Ritchie, and Stephanie J. Watson for three-year terms (2020-2022) on the Committee on Committees (ConC).

<table>
<thead>
<tr>
<th>Name</th>
<th>Votes</th>
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<tbody>
<tr>
<td>Satinder Ahuja</td>
<td>99</td>
</tr>
<tr>
<td>*Lisa M. Balbes</td>
<td>242</td>
</tr>
<tr>
<td>*D. Richard Cobb</td>
<td>266</td>
</tr>
<tr>
<td>Harry J. Elston</td>
<td>78</td>
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<tr>
<td>*Emilio X. Esposito</td>
<td>247</td>
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<td></td>
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<tr>
<td>Sarah M. Mullins</td>
<td>175</td>
</tr>
<tr>
<td>*Jason E. Ritchie</td>
<td>210</td>
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<tr>
<td>Susan M. Schelble</td>
<td>172</td>
</tr>
<tr>
<td>Andrea B. Twiss-Brooks</td>
<td>169</td>
</tr>
<tr>
<td>*Stephanie J. Watson</td>
<td>176</td>
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II. Other Council Actions

Continuation of Committees

On the recommendation of the Committee on Committees, and with the concurrence of the Council Policy Committee, Council approved the continuation of the Committees on International Activities and Professional Training, contingent on approval by the Board of Directors.

Establishment of an International Chemical Sciences Chapter

On the recommendation of the Committee on International Activities, and with the concurrence of the Council Policy Committee, Council approved the creation of an ACS International Chemical Sciences Chapter in the Republic of Georgia, contingent on approval by the Board of Directors.
Redistricting of a Local Section

On the recommendation of Nominations & Elections, the Council voted that the Pittsburgh Local Section be transferred from District II to District III in order to bring District III’s member population into compliance with bylaw requirements.

Resolutions

The Council passed resolutions:
- in memory of former Executive Director John Kistler Crum;
- in memory of other deceased Councilors;
- in recognition and celebration of the 100th birthday of Gerald Meyer, and his 80 years of service to the Society
- in gratitude for the officers and members of the San Diego Local Section - host Section for the 258th National Meeting, the divisional program chairs and symposium organizers, and ACS staff; and
- acknowledging Bonnie A. Charpentier’s service as ACS President and presiding officer of the Council.

Highlights from Committee Reports

Nominations and Elections

Ballots for the 2019 fall national election will be distributed starting on September 30th, with a voting deadline four weeks later on October 25th. ACS members eligible to vote and with an email address on file will receive an electronic ballot with the option to request a paper ballot. Those members with no email address on file will be sent a paper ballot with the option to vote electronically. The ACS election vendor, Survey & Ballot Systems, will send three email reminders during the voting period to those who have not voted as of the reminder dates. N&E encourages all ACS members to vote for President-Elect and the Constitutional Amendment. Election information may be viewed at acs.org/elections.

Budget and Finance

The Society’s 2019 financial performance through July 31st yielded a Net from Operations of $30.1 million. This is $10 million favorable to the Approved Budget, and $1.7 million less than the same period in 2018. Total revenues are right on budget at $338 million. Total expenses are $308 million, which is $10 million favorable to budget.

The committee considered two 2020 program funding reauthorization requests, and on its recommendations, the Board subsequently approved funding for the ChemIDP and the International Student Chapters Programs in the 2020 Proposed Budget.

The committee considered new program funding requests for 2020 as well. The Board subsequently approved funding for the Green and Sustainable Chemistry Education Resources pilot for inclusion in the 2020 Proposed Budget.

The Society is expected to end the year in compliance with each of the five Board-established financial guidelines. Additional information can be found at www.acs.org. At the bottom of the page, click ‘About ACS’, then ‘Financial’.

San Diego Meeting Attendance

The theme of the 258th National Meeting was “Chemistry and Water.” As of August 27, attendance was:

- Attendees 7,488
- Students 3,095
- Exhibitors 995
- Expo only 430
- Guest 401
- Total 12,409

HIST Councilors

Mary Virginia Orna is serving as a member of the Divisional Activities Committee (DAC) and the DAC Technical Programming and Collaboration Subcommittee. She was able to report to the HIST Executive
Committee the developing rubric for evaluating Innovative Project Grant (IPG) proposals, the summarized best practices gleaned from former successful IPGs, the progress of her subcommittee on drafting a pilot project called “Convergent Research Communities,” and the possible use of “ACS Change Drivers” to create more engaging programming.

Roger Egolf is serving as a member of the Meetings and Expositions Committee (M&E) and its Technical Program Subcommittee. That subcommittee is responsible for advising the ACS meetings staff on the format of national meeting technical programming and the allocation of meeting rooms to the various divisions.

Report prepared and submitted by Mary Virginia Orna and Roger Egolf, HIST councilors

News and Announcements

HIST Award

The History of Chemistry Division of the American Chemical Society is proud to present the 2019 HIST Award for Outstanding Achievement in the History of Chemistry to Lawrence M. Principe for “his insightful and groundbreaking studies of the actual laboratory chemistry and its documentary presentation in the 17th and 18th centuries.”

Lawrence (Larry) M. Principe was born in northern New Jersey in 1962. He first fell in love with alchemy while studying at the University of Delaware (B.S. Chemistry, B.A. Liberal Studies, 1983). A “dual approach” to the history of Chemistry has characterized his work ever since. He obtained a Ph.D. in Organic Chemistry from Indiana University in 1988, but his love of the History and Philosophy of Science motivated him to earn a second Ph.D. at Johns Hopkins University in History of Science, from which he graduated in 1996. His thesis became the best-selling book: The Aspiring Adept: Robert Boyle and His Alchemical Quest (Princeton, 1998). Meanwhile, the Chemistry Department at Johns Hopkins took advantage of the presence of a star organic chemist by hiring him as a Laboratory Instructor. He progressed through the ranks of the non-tenure track faculty in Chemistry, but when an actual tenure-track position in the History of Science opened, he was chosen in 1997 for a joint-appointment between Chemistry and History of Science. In 2006 he was honored as the endowed Drew Professor of the Humanities, with Chairs in both Chemistry and the History of Science. Larry Principe is indeed a HIST unicorn.

Principe continued his Boyle scholarship and joined with Michael Hunter and Antonio Clericuzio to produce the six volume complete Correspondence of Robert Boyle (Pickering and Chatto, 1999-2000). Not only was Larry a superb laboratory chemist, but he was capable of the most demanding and detailed scholarship.

One of the ongoing projects that Larry has contributed to the worldwide community of scholars of alchemy is his collaboration with William Newman. They jointly examined the laboratory notebooks of George Starkey and Robert Boyle and discovered the actual chemistry being shared. Their deep insights into the realities of 17th century chymistry have revolutionized the discussion of science in this time period. This project produced Alchemy Tried in the Fire (Chicago, 2002), which won the History of Science Society’s Pfizer Prize (2005), given for the best book in the History of Science in the prior three year period.

Another contribution to the community was the organization of the 2006 conference on alchemy held at the Chemical Heritage Foundation. One hundred thirty-five scholars of alchemy gathered and listened to erudite discourses and engaged in intense discussions about all aspects of the scholarship of
alchemy. The volume *Chymists and Chymistry* (Science History Publications, 2007, edited by L. M. Principe) is the record of this event. It has proved to be a major stimulant to research into alchemy ever since.

Larry Principe has also contributed one of the best works intended for a broader audience interested in alchemy: *The Secrets of Alchemy* (Chicago, 2013). In addition to a nuanced history of the development of alchemy from ancient times to the present, it employs actual laboratory reconstructions of classic recipes for *arcana*. Rather than mythical stories about fictional materials, Principe has used the real materials and discovered just how the laboratory procedures were followed. He produced many classic alchemical materials and presents visual evidence in the book. This attempt to fully contextualize human activity in chemistry (chymistry) has revolutionized the understanding of the 17th century (and beyond).

Not content to become merely a 17th century specialist, he has struck out in both directions. Starting in 2004, he organized an international workshop at CalTech, which gave opportunity to produce *New Narratives in Eighteenth-Century Chemistry* (Springer, 2007), containing his opening salvo regarding the inadequacies of the historiography of 18th century chemistry. The culmination of this work is the book: *The Transmutations of Chymistry: Wilhelm Homberg and the Academie Royale des Sciences* (Chicago, 2020). This book is already poised to produce both many awards and to jump-start a re-appraisal of the narrative of this era. There is much more to discuss than the work of Lavoisier.

Lawrence M. Principe has already received many awards and honors. Among these, he was the recipient of the Franklin-Lavoisier Prize of the Maison de la Chimie and the Chemical Heritage Foundation in 2016. He was the George Sarton Memorial Lecturer of the AAAS in 2011. He received the Francis Bacon Award for the History and Philosophy of Science in 2004.

Submitted by Gary Patterson

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**History of Chemistry Documentary**

*All Things Bakelite: The Age of Plastic* tells the joyous and provocative story about the “Father of Modern Plastic,” Leo Hendrik Baekeland (shown in his lab). In 1907, this Belgian-born American chemist made one of the most transformative discoveries of the 20th century, the first wholly synthetic plastic, which he called Bakelite. This invention was integral to the beginning of the modern industrial age, ushering in a myriad of plastics that have improved our lives and supported critical advancements.

History comes alive in this unique and innovative 59-minute documentary. Reenactments of Baekeland’s life, rare archival footage, photos and journal entries, interviews with scientists, historians, artists and satirical musical performances capture both the wonder and the curse of Baekeland’s discovery.

The primary source and inspiration for this illuminating film is great grandson of Baekeland, Hugh Karraker, the film’s executive producer. While the film celebrates Baekeland, his invention and its descendants, it does not shy away from the global plastic problem. In the end, it offers a view into essential solutions.

You can learn more about the history at [www.allthingsbakelite.com](http://www.allthingsbakelite.com).

Submitted by Marc Huberman
History of Chemistry Books

A New ACS Volume

We are pleased to announce the recent publication of the ACS book on the history of chemistry titled “Chemistry’s Role in Food Production and Sustainability: Past and Present”, which is edited by Mary Virginia Orna, Gillian Eggleston, and Alvin F. Bopp. As with all ACS eBooks, Chapter 1 is freely available to read online, and the printed copy of the book will be available to purchase from OUP with the 30% ACS Members discount.

The Table of Contents can be viewed at https://pubs.acs.org/isbn/9780841234284.

Call for Papers

Historical Thoughts on ‘From Bench to Market’ will be a HIST symposium, which will take place at the San Francisco 2020 ACS Meeting. While some chemists pursued purely avocational interests, most chemists in the last 500 years had a primary interest in selling the product of their labor. When they could reproducibly and reliably synthesize materials of commercial interest, they often sought to market their wares. This process started more than 25,000 years ago with the pigments that were used to paint images in caves. They continued with the cosmetics used to paint Queens and the purple used to dye clerical vestments. This symposium seeks to present historical instances where a clear improvement in technique or understanding led to a commercially viable product.

Please consider contributing to this MPPG themed HIST Symposium. Real Chemistry happens in the laboratory, but it stops when the money runs out. Only the brave chemists who risked both their fortunes and their lives brought chemistry to market.

Submitted by Gary Patterson

Continuing to Celebrate the Periodic Table

Elemental Art: A Competition Open to All

As announced previously, we are delighted to invite original art contributions, including poems, cartoons, or photographs, the subject of which is a specific chemical element (e.g., its discovery, properties, uses), group of elements, or the Periodic Table itself. The submissions must be received by August 31 2020 (please note the extended deadline). They will be reviewed by a panel, and three winners will be selected in each of the three categories. The winners will receive certificates and monetary awards ($250, $200, or $150 for first, second, and third place, respectively) and the best artworks will be published in the HIST Newsletter, on the HIST website, and other publicly available sources. Submissions should be sent to the HIST program chair, Nick Tsarevsky (nvt@smu.edu or nicktsarevsky@gmail.com), as attachments to an email, the subject line of which reads “Elemental Art Competition – XYZ” (where “XYZ” stands for the name of the person who created the artwork). The winners will be informed in the late fall of 2020 and will be announced at a future ACS meeting at a HIST symposium.
BULLETIN FOR THE HISTORY OF CHEMISTRY

A publication of the Division of the History of Chemistry of the American Chemical Society

Available online: http://www.scs.illinois.edu/~mainzv/HIST/bulletin/index.php

PAPER SUBMISSIONS: Articles of 4-20 pages, double-spaced (excluding references) should be submitted electronically by email attachment to the Editor, Carmen Giunta, at giunta@lemoyne.edu. The title of the article should be of reasonable length (up to 15 words); a subtitle may be included if appropriate. Authors should strive to make the title descriptive of the specific scope and content of the paper. Preferred file formats for submissions are .doc, .docx, and .rtf.

Full instructions for authors can be found at http://www.scs.illinois.edu/~mainzv/HIST/info/bull-info.php or in the back cover of all issues of the Bulletin.

All matters relating to manuscripts, etc. should be sent to:
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1419 Salt Springs Rd.
Syracuse, NY 13214-1301
Email: giunta@lemoyne.edu
Message from the HIST Program Chair

Welcome to the 259th ACS National Meeting and to the great city of Philadelphia! On behalf of HIST, I am delighted to invite you to attend as many lectures as you can at the symposia offered by the Division. I know you will find this to be an efficient and pleasant way to learn, get fascinated and inspired by the rich history of our discipline, and meet new (or greet some old) friends. As is often the case, we will start on Sunday morning and will finish on Tuesday (all day) with General Papers and Tutorial sessions. You will have the chance to enjoy a selection of papers on diverse topics. On Sunday afternoon, we will celebrate the life and many achievements of a remarkable chemist, entrepreneur, philanthropist, art collector and connoisseur, whom the chemistry community lost in December of 2018 – Alfred Bader. In the 1950s, he co-founded Aldrich Chemical Company (known to all chemists) and in 1998 (the 75th anniversary of Chemical & Engineering News), he was chosen by the readers of the Magazine as one of the top 75 contributors to the chemical enterprise. The symposium is organized by Mary Virginia Orna and will feature lectures by several of Dr. Bader’s colleagues and close friends and admirers. On Monday (all day), we will celebrate one very important anniversary – the 100th year since the publication of the influential paper by Hermann Staudinger (Ber. Deutsch. Chem. Ges., 1920, 53, 1073), in which the idea was put forward that the molecules of polymers (rubber, starch, cellulose, polystyrene, etc.) are long chains consisting of short repeating units connected by regular covalent bonds. Although Staudinger went on to win the Nobel Prize in Chemistry in 1953, at the time the macromolecular hypothesis was first described, it was by no means accepted universally, and a number of eminent chemists believed that the experimentally determined high molecular weights of the mentioned substances were merely apparent and the result of colloid-like aggregation of smaller molecules. Even though some may find the thought incorrect or exaggerated, we do live in the Polymer age (just look around, if you are not fully convinced), which is why the anniversary of the event that marked the beginning of our understanding about what polymers are, is truly important and worth celebrating. The History of Polymer Science symposium is co-organized by three polymer scientists at HIST – Gary Patterson, Seth Rasmussen, and myself. You will be able to learn about the most important discoveries in polymer chemistry and physics as well as about some of the contributors to the field and the places where important discoveries were made. On Monday night, during the SciMix session, please stop by the HIST table at Division Row. We will be happy to tell you more about the Division and to listen to ideas you may have about future symposia and other events. We hope you and your friends would become interested in getting involved in one of the most interdisciplinary divisions of the ACS. When you are not attending a lecture or discussing a poster, I encourage you to take advantage of the location of the ACS meeting and visit our friends at the Science History Institute and their outstanding museum, which every professional chemist or science enthusiast should see.

In the last HIST Newsletter, I announced a HIST-sponsored contest, open to all, which we dubbed Elemental Art. In order to compete with your peers, submit an original art piece (a poem, a photograph, or a cartoon) dedicated to the elements, their discovery, or applications, or to the Periodic Table itself. The contest is still ongoing and submissions can be sent to me (at either nvt@smu.edu or nicktsarevsky@gmail.com) until August 31, 2020 (please note that we extended the original deadline). I remind you that there will be winners and awards!

My fellow HIST-ers and I wish you a productive and fulfilling meeting! We would love to see you at our sessions and talk with you!

Nick Tsarevsky, HIST Program Chair
HIST SYMPOSIA, 259th ACS Meeting in Philadelphia, PA, March 22-26, 2020
Schedules and abstracts are listed at the end of this Newsletter.

UPCOMING MEETINGS AND HIST DEADLINES
Subject to change. Check the HIST website (http://www.scs.illinois.edu/~mainzv/HIST/) for updates.

260th ACS Meeting, San Francisco, CA, August 16-20, 2020
(abstract submission deadline – April 6, 2020)

HIST Tutorial and General Papers (Seeking contributors) Nicolay V. Tsarevsky, Department of Chemistry, Southern Methodist University, Dallas, TX 75275, Phone: (214) 768-3259, email: nvt@smu.edu

HIST Award Symposium (Invited) Nicolay V. Tsarevsky, Department of Chemistry, Southern Methodist University, Dallas, TX 75275, Phone: (214) 768-3259, email: nvt@smu.edu

Springer Briefs in the History of Chemistry: 10th Anniversary (Invited) Seth C. Rasmussen, Department of Chemistry and Biochemistry, North Dakota State University, NDSU Dept. 2735, P.O. Box 6050, Fargo, ND 58108, Phone: (701) 231-8747, email: seth.rasmussen@ndsu.edu

Historical Thoughts on ‘From Bench to Market’ (Invited and contributed) Gary Patterson, Vancouver, WA 98661, (412) 480-0656, email: gp9a@andrew.cmu.edu; David E. Lewis, Department of Chemistry, University of Wisconsin-Eau Claire, Phone: (715) 836-4744, email: lewisd@uwec.edu

The Science and Legacy of Glenn Seaborg (Invited) Roger Egolf, Pennsylvania State University - Lehigh Valley Campus, Center Valley, PA 18034, Phone: (610) 285-5110, Email: rae4@psu.edu and Jan Hayes, Email: janan.hayes@gmail.com

261st ACS Meeting, San Antonio, TX, March 21-25, 2021

HIST Tutorial and General Papers (Seeking contributors) Nicolay V. Tsarevsky, Department of Chemistry, Southern Methodist University, Dallas, TX 75275, Phone: (214) 768-3259, email: nvt@smu.edu

History of Forensic Chemistry (Invited and contributed) Nicolay V. Tsarevsky, Department of Chemistry, Southern Methodist University, Dallas, TX 75275, Phone: (214) 768-3259, email: nvt@smu.edu

ACS Presidents from the South (Invited) Roger Egolf, Pennsylvania State University - Lehigh Valley Campus, Center Valley, PA 18034, Email: rae4@psu.edu and Jan Hayes, Email: janan.hayes@gmail.com
**HIST Tutorial and General Papers** *(Seeking contributors)* Nicolay V. Tsarevsky, Department of Chemistry, Southern Methodist University, Dallas, TX 75275, Phone: (214) 768-3259, email: [nvt@smu.edu](mailto:nvt@smu.edu)

**HIST Award Symposium** *(Invited)* Nicolay V. Tsarevsky, Department of Chemistry, Southern Methodist University, Dallas, TX 75275, Phone: (214) 768-3259, email: [nvt@smu.edu](mailto:nvt@smu.edu)

**History of Glass** *(Invited and contributed)* Seth C. Rasmussen, Department of Chemistry and Biochemistry, North Dakota State University, NDSU Dept. 2735, P.O. Box 6050, Fargo, ND 58108, Phone: (701) 231-8747, email: [seth.rasmussen@ndsu.edu](mailto:seth.rasmussen@ndsu.edu)
Final Program

DIVISION OF THE HISTORY OF CHEMISTRY (HIST)

N. V. Tsarevsky, Program Chair

SUNDAY MORNING

Pennsylvania Convention Center,
120C

General Papers & Tutorial

N. V. Tsarevsky, Organizer, Presiding
C. J. Giunta, S. C. Rasmussen, Presiding

8:45 HIST 1. Teaching history of chemistry: Pedagogical elements leading to student success. S.B. Mitchell

9:15 HIST 2. Marie M. Daly, Ph.D.: Scientific contributions and legacy. L.C. Meade-Tollin

9:45 HIST 3. Dr Marie Maynard Daly: Her life and work. J.E. Brown

10:15 Intermission.


11:00 HIST 5. Nikolai Aleksandrovich Menshutkin (1834-1907): Physical organic chemistry four decades before Hughes and Ingold. D.E. Lewis

SUNDAY AFTERNOON

Pennsylvania Convention Center,
120C

The Life & Legacy of Alfred Bader
Cosponsored by SCHB
M. Orna, Organizer, Presiding

1:00 Introductory Remarks.

1:05 HIST 7. Alfred Bader: Extraordinary journey remembered. M.S. Jacobs

1:30 HIST 8. How seeds grow: Project SEED mentor perspective. S.L. Haynie

1:50 HIST 9. How project SEED propelled one undergraduate into a potential research career. M. Ortiz

2:10 HIST 10. Visiting the University of Wisconsin at Eau Claire. A.A. Denio


2:55 HIST 12. Alfred Bader: Chemistry connector and art collector. V. Snieckus

3:25 Concluding Remarks.

SUNDAY EVENING

Pennsylvania Convention Center,
120C

5:00 - 7:00 HIST Executive Committee Meeting
Pennsylvania Convention Center,

120C

History of Polymer Science

Cosponsored by CELL‡
G. D. Patterson, S. C. Rasmussen, N. V. Tsarevsky, Organizers, Presiding

8:30 HIST 13. From polymer to macromolecule: Historical evolution of polymer terminology. **S.C. Rasmussen**

9:00 HIST 14. Learning about the macromolecules of life through historical developments in biophysical chemistry. **W.K. Olson**

9:30 HIST 15. Early observations and studies of the radical polymerization of vinyl and vinylidene compounds. **N.V. Tsarevsky**

10:00 HIST 16. Following the PVC pipeline: Misconceptions and milestones from discovery to industrialization. **E.W. Culver**, S.C. Rasmussen

10:30 Intermission.

10:40 HIST 17. History of Poly(organophosphazenes). **H.R. Allcock**

11:10 HIST 18. History vs. legend: Discovery and development of conducting polymers. **S.C. Rasmussen**

11:40 HIST 19. All things Bakelite: Age of plastics documentary film. **H. Karraker**
MONDAY AFTERNOON

Pennsylvania Convention Center,
120C

History of Polymer Science

Cosponsored by CELL‡
G. D. Patterson, S. C. Rasmussen, N. V. Tsarevsky, Organizers, Presiding

1:30 HIST 20. Nifty fifty: Polymer scientists who created the discipline. G.D. Patterson

2:30 HIST 21. Staudinger, Sakurada, and the macromolecular debate in the 1930s. Y. Furukawa

3:00 HIST 22. Walter H. Stockmayer and polymer science: Dartmouth years. J. Lipson

3:30 HIST 23. Professor Mihai Dimonie’s contribution to polymer science and the education of many generations of students at the Politehnica University of Bucharest. M.C. Stefan, M. Teodorescu, H. Iovu, S. Coca, G. Hubca, L. Dinca

4:00 Intermission.

4:10 HIST 24. Brief history of the Polymer Science and Engineering Department at the University of Massachusetts. T.P. Russell

4:40 HIST 25. Origin and development of polymer science in India: Historical perspectives. S. Sivaram

5:10 HIST 26. Chemical philately and a stamp collector’s view of polymer science. D. Rabinovich
MONDAY EVENING

Pennsylvania Convention Center,
Exhibit Hall A

Sci-Mix
N. V. Tsarevsky, Organizer

8:00 - 10:00

HIST 3, 10, 14, 17, and 24: see previous listings.
HIST 27, 31, 32, 33, and 35: see subsequent listings.

TUESDAY MORNING

Pennsylvania Convention Center,
120C

General Papers & Tutorial
N. V. Tsarevsky, Organizer, Presiding
C. J. Giunta, S. C. Rasmussen, Presiding

8:45 HIST 27. Invention of the GC-MS. M.E. Jones, S. Rovner
9:45 HIST 29. Drugs that shaped the FDA from elixir sulfanilamide to thalidomide. J.L. Epstein
10:15 HIST 30. Withdrawn
10:45 Intermission.

11:00 HIST 31. Use of a graph database to explore the history of chemistry: Chemistry of history. **K.J. Boyd**, D. Escudero

11:30 HIST 32. Artists' perspectives on the history of chemical disasters. **D.B. Cordes**

**TUESDAY AFTERNOON**

Pennsylvania Convention Center,

120C

**General Papers & Tutorial**

N. V. Tsarevsky, *Organizer, Presiding*
C. J. Giunta, S. C. Rasmussen, *Presiding*

1:00 HIST 33. Manufacturing white lead in the new republic: Review of the Wetherill's stack process. **K.C. Cannon**

1:30 HIST 34. Indigo plantation in India: Connecting history with chemistry. **A. Rahman**, J. Hua, Y. Yoon, X. Jiang, R. Rajeev

2:00 HIST 35. Ski wax: Skier's edge in extracting competitive advantage. **B.J. Love**

2:30 HIST 36. Superphosphate and the development of industrial chemistry at Newtown Creek in 19th century New York. **P. Spellane**

**Historical Perspectives on Cellulose & other Renewable Materials**

Sponsored by CELL, Cosponsored by BIOT, HIST‡ and MPPG‡
HIST 1

Teaching history of chemistry: Pedagogical elements leading to student success

Sally B. Mitchell, sbmitchell2@gmail.com. Science, Rye High School, Rye, New York, United States

In celebration of the International Year of the Periodic Table #IYPT2019 and the 150th birthday of the periodic table, the Rye High School ChemClub teamed up with students in the first chemistry class to create the “Peepiodic table of the elements” in the Open Notebook’s Peep’s contest. Each student adopted one element to research and then decorated a peep to display one concept or fact about the element. A short abstract was written about the history of the element and the “inspiration” as to why the peep was decorated in such a manner. This tutorial will explore the pedagogical elements that led to the success of the project in terms of fulfillment of the goals of the chemistry course and of the Next Generation Science Standards.

HIST 2

Marie M. Daly, Ph.D.: Scientific contributions and legacy

Linda C. Meade-Tollin, lmt2050@gmail.com. Surgery, University of Arizona College of Medicine, Tucson, Arizona, United States

Marie M. Daley, Ph.D., a scientific pioneer, was the first female African American to receive a Ph.D. in chemistry. This presentation will provide an overview and discussion of her research and academic contributions during a highly respected career that spanned the years between 1949 and 1985.
HIST 3

Dr Marie Maynard Daly: Her life and work

Jeannette E. Brown, jebrown@infionline.net. SisterChemists LLS, Hillsborough, New Jersey, United States

Dr. Marie M. Daly was the first African American Woman to receive a Ph.D in Chemistry. I will speak about her life growing up and going to school. Then I will talk about how she went to college and grad school. Finally I will speak about her work and why she should be considered for a photo award at one of the places she worked and or her college.

HIST 4

Paul Caspar Freer (1861-1912): Expatriate American chemist

William Palmer, drspalmer@optusnet.com.au. Education, Curtin University, Brighton, Victoria, Australia

Paul C. Freer was born in 1862 in Chicago. His father was a successful doctor who eventually became President of Rush Medical College. He died young in a severe epidemic of typhoid fever. Paul's mother was born in Germany but had moved to New Orleans. After the death of her husband, she took the children back to Germany where Paul received his elementary education. The family returned to Chicago where Paul received his secondary education becoming top of his class. After high school Paul entered Rush Medical College and to study medicine but was finally attracted to chemistry. He graduated from Rush Medical College with the class of 1882, aged twenty. He then studied under Professor von Baeyer at the University of Munich obtaining his doctorate 'summa cum laude'. He spent a short time in England in the private laboratory of Sir William Perkin working on aniline dyes and later at Owens College in Manchester. He returned to Ann Arbor, Michigan in 1889, being employed as a lecturer at University of Michigan. Later, he became Professor of Chemistry. He successfully re-organised the Department on the German model emphasising chemical research. He had a long-standing interest in science education and was an excellent public speaker. He wrote one of the better school textbooks of its era entitled, Elements of Chemistry. In 1905, he was appointed to the US Bureau of Science (as Director) and became superintendent of the government laboratories in Manila in the Philippines. He was expected to have a very influential career. However, his death in April 1912 from a stomach complaint (intestinal abscesses) tragically cut short his career. He was fondly remembered by both Americans and Filipinos for his scientific work in the Philippines.
HIST 5

Nikolai Aleksandrovich Menshutkin (1834-1907): Physical organic chemistry four decades before Hughes and Ingold

David E. Lewis, lewisd@uwec.edu. Chemistry Department, UW-Eau Claire, Eau Claire, Wisconsin, United States

The deaths of Beilstein (1906), Mendeleev (1907) and Menshutkin (1907), following the deaths of Markovnikov (1904) and Vagner (Wagner, 1903) signaled the end of an era in organic chemistry in the Russian Empire. Each of these chemists in one way or another is well known to modern organic chemists: Mendeleev through his Periodic Table, and the others through eponymous reactions, rules and tests. One of the less appreciated members of this group, Nikolai Aleksandrovich Menshutkin (the first Editor of the Journal of the Russian Chemical Society, is the subject of this paper. In an era when organic chemistry was basically a qualitative science, Menshutkin was among the first to obtain quantitative data for the influence of structure on the rates of chemical reactions. In one study, he studied the rates of quaternization of tertiary amines with alkyl bromides and iodides, a reaction that has come down to us as the Menshutkin reaction. However, this was not the only reaction he studied. He also studied the effects of structure on the rate of the Williamson ether synthesis, and the effects of alcohol structure on the rates of esterification. Menshutkin’s life and chemistry will be explored.

HIST 6

Early women chemists in Chicago: Romp through the first decade of The Chicago Chemical Bulletin (1914-1924)

Margaret E. Schott, m-schott@northwestern.edu. Chemistry, Northwestern University, Evanston, Illinois, United States

In October 1914 the Chicago Section of ACS began publishing a monthly newsletter called The Chicago Chemical Bulletin. This publication was a wide-ranging one that incorporated chemistry-related news from several major Midwest cities surrounding Chicago, editorials, news from “the front” during World War I, advertisements, humorous stories, information on upcoming meetings, and more. The same publication continues today as The Chemical Bulletin. This presentation will look at the increasing role of women in the activities of the Chicago Section and in industry through the lens of the bulletin during its first decade of existence. Consider, for example, this statement from an article in the April 1916 issue: “The reasons urged against employing women, other than habit and prejudice, are that a chemist needs a first-hand knowledge of the factory processes and must be able to go out and collect samples – ‘to go and test a coal mine, to sample a car of coal in the railroad yard.’” Thankfully, things began to change gradually over time. In addition to coverage of employment matters, one can find stories on new women’s
buildings on college campuses and letters on the paucity of women members in the Chicago Section and in ACS. Additionally, there is coverage of the first Section meeting planned by women in December 1918, colorfully worded mention of the lack of courtesy shown to women when meeting rooms are full of smoke, descriptions of opportunities for women during and after the war effort, pointers for women chemists, and women in leadership roles. Links to the archives of The Chemical Bulletin can be found online at Hathitrust and at the Chicago Section website.

**HIST 7**

**Alfred Bader: Extraordinary journey remembered**

*Madeleine S. Jacobs, madeleine.susan.jacobs@gmail.com. Strategic Science, North Potomac, Maryland, United States*

Alfred Bader began life under difficult circumstances that got worse before they got better. Despite the hardships he endured, he succeeded in building a successful chemical business, found the love of his life, and became a renowned art collector. Then, he became a philanthropist, giving to many worthwhile causes, including ACS’s Project SEED. This remarkable journey is remembered.

**HIST 8**

**How seeds grow: Project SEED mentor perspective**

*Sharon L. Haynie\(^1,2\), lorimer@earthlink.net. (1) DuPont, Philadelphia, Pennsylvania, United States (2) Hypatia Technology Works, LLC, Philadelphia, Pennsylvania, United States*

This talk will share my insights from my experiences with Project SEED students at the DuPont Experimental Station Laboratory. The Project SEED students were from high schools in Newcastle County, Delaware and were usually the only young teenager in a large research community and I had to learn what conditions best cultivated a good welcoming growth environment. I will share a few of the research contributions and educational and life trajectories beyond their summer SEED experiences.
HIST 9

How project SEED propelled one undergraduate into a potential research career

Mirka Ortiz, mirka.ortiz@yahoo.com. Chemistry, New Jersey City University, Jersey City, New Jersey, United States

Mirka Ortiz participated in Project SEED as both a Summer I and Summer II student. Her first summer as a rising junior, in 2016, was with Dr. Reed Carroll at New Jersey City University (NJCU) where she worked on regulating the balance of neural and chemical activity in the brain. She returned to NJCU the following summer to work with Dr. Robert Aslanian on the development of improved microwave-assisted synthetic methods of hydroxamic acids and esters from carboxylic acids. The following fall, Mirka applied for the Alfred and Isabel Bader Scholarship, and received $5,000 towards her freshman year at NJCU. She found that her summer experiences in Project SEED helped to advance her to Sophomore and Junior-level chemistry courses, and to a slot in an organic chemistry research internship as a freshman. This made her incredibly competitive when she later applied for CIBA and Loconti scholarships. Mirka was unanimously selected as the very first Joseph D. Loconti Scholar, guaranteeing an additional three years of scholarship funding. She joined the university chemistry undergraduate student research club and attends technical seminars given by NJCU alumni. One such speaker was a Project SEED alumnus who offered her an internship with Merck for her sophomore year in college. Mirka hopes to pursue a Ph.D. in chemistry and a possible career in pharmaceutical chemistry. Mirka will share how her experience as a SEED student has impacted her view on chemistry as a career and has influenced her time as a college student.

HIST 10

Visiting the University of Wisconsin at Eau Claire

Allen A. Denio, alvaldenio@verizon.net. Chemistry, Univ. of Wisconsin-Eau Claire, Newark, Delaware, United States

I joined the faculty at UWEC in 1964 in a rapidly growing Department of Chemistry. We purchased many chemicals from the Aldrich Chemical Company in Milwaukee. Dr. Alfred Bader decided to visit our department to learn more about a customer. He was impressed by our new Chemistry/Business Major and eventually hired some of our grads. In one of his visits he gave a lecture in the School of Business in the morning, a Chemistry Seminar at noon, followed by a talk in the Art Department on Art History in the afternoon! After his Art Department visit, he offered to loan us some of his art collection for an exhibit in the new gallery. After a visit to his home and the Aldrich Chemical Company to see what was available, he loaned us a nice collection of his paintings for what turned out to be a very impressive gallery exhibit. We mourn the loss of this great chemist/humanitarian.
HIST 11

Alfred Bader: Masterpiece of a life

Dudley Herschbach², Mary Virginia Orna¹, maryvirginiaorna@gmail.com. (1) Chemistry, The College of New Rochelle, New Rochelle, New York, United States (2) Chemistry, Harvard University, Cambridge, Massachusetts, United States

In 1995, Alfred Bader, at the age of 71, published his autobiographical book, “Adventures of a Chemist Collector.” Thirteen years later, a welcome sequel, “Chemistry and Art: Further Adventures of a Chemist Collector,” appeared. Both volumes, reviewed by the first author of this paper, together chronicle an extraordinary life marked by resolve and enterprise in the face of almost insurmountable difficulties. Bader was a virtual orphan, persecuted refugee, “enemy alien,” and penniless emigré who emerged with a Harvard Ph.D. and went on to found a billion dollar chemical business. This paper will summarize Bader’s remarkable career from his start as an astute entrepreneur who recognized and capitalized on a niche market to his passionate art collecting and his equally passionate desire to give back through helping the neediest and the ablest via many massive and creative philanthropic projects.

HIST 12

Alfred Bader: Chemistry connector and art collector

Victor Snieckus, baderadm@chem.queensu.ca. Chemistry, Queen's University, Kingston, Ontario, Canada

An unmatchable legacy. With devotion and love, Alfred Bader championed his lifelong pursuits of chemistry and art by donations, program initiations, and assistance in immeasurable ways. His “Please bother us” on an Aldrich Chemicals catalogue is recognized by chemists worldwide. The regular dedicated visits of Alfred and Isabel Bader to Queen’s and its UK campus (the Bader International Study Centre, Herstmonceux Castle) are vibrant reminiscences that will stay forever with our students and faculty. In this lecture, a perspective from Queen’s University, our Department of Chemistry, and personal will be offered.
HIST 13

From polymer to macromolecule: Historical evolution of polymer terminology

Seth C. Rasmussen, seth.rasmussen@ndsu.edu. Department of Chemistry and Biochemistry, North Dakota State University, Fargo, North Dakota, United States

The common term “polymer” was initially introduced in 1832 by Jacob Berzelius, although its initial meaning differed significantly from the modern use. The accepted meaning of the word then changed over time, particularly with the growing number of reactions being referred to as polymerizations in the late 1800s and early 1900s. As the field of polymeric materials developed, the broader uses of the term polymer was one factor that led Hermann Staudinger to introduce the alternate term “macromolecule” in the 1920s to specifically designate long-chain polymeric species. Of course, further terms were also eventually required to differentiate between different types of polymeric species, including “copolymer”, “homopolymer”, and “oligomer”. The origins, history, and evolution of these various terms used in reference to polymeric materials will be presented.

HIST 14

Learning about the macromolecules of life through historical developments in biophysical chemistry

Wilma K. Olson, wilma.olson@rutgers.edu. Rutgers, the State University of New Jersey, Piscataway, New Jersey, United States

Teaching from the scientific literature allows students to trace the history of key discoveries and scrutinize the thinking of scientists as new observations and ideas emerge over time. This presentation will describe the historical perspective taken and the literature used as source material for a graduate course offered by the speaker on the three-dimensional structures, interactions, and properties of proteins, nucleic acids, and their macromolecular assemblies. The course starts with early ideas on the structures of fibrous proteins and synthetic polypeptides and includes deep examination of a series of articles spanning a period of ~70 years on the development of principles and predictions of protein energetics, folding, motions, and assembly. The study of nucleic acids covers papers on the discovery of the double helix, influences of sequence and environment on DNA and RNA at increasing molecular levels, and principles of protein-nucleic acid recognition. The class also discusses relevant scientific correspondence available through on-line historical resources and gains familiarity with various databases and software tools helpful in understanding and manipulating the 3D structures of biological macromolecules.
Early observations and studies of the radical polymerization of vinyl and vinylidene compounds

Nicolay V. Tsarevsky, nvt@smu.edu. Department of Chemistry, Southern Methodist University, Dallas, Texas, United States

By the close of the 19th Century numerous observations had been made related to the ability of unsaturated (vinyl and vinylidene) compounds to form thick oils or resinous substances with the same elemental composition as the starting material when stored and especially when heated or exposed to light. For instance, in 1835, Victor Regnault reported the polymerization of vinyl chloride and three years later, he described that vinylidene chloride, when stored in sealed ampoules, deposits a white non-crystalline substance, which he considered an isomeric form. While studying the properties of acrolein and acrylic acid in 1843, Josef Redtenbacher noticed that the former formed resin, named “disacryl”, when heated. In the same year, the formation of glass-like material from styrene (which refracted light very strongly and was “not improbable that it might be applied to several optical purposes”) was described by John Blyth and August Wilhelm von Hoffman. In fact, the “steady conversion of the oil [styrene] by air, light, and heat to a rubberlike substance” was communicated in 1839 by E. Simon who assumed the compound was styrene oxide. The nature of these and many other similar transformations was unclear and was the subject of speculations and (occasionally, lucky) guesses. There were indications that radicals were involved in the processes. For example, as early as 1924, Charles Moureu and Charles Dufraisse showed that hydroquinone, which inhibits the oxidation of acrolein (a chain reaction), also inhibits the formation of resin from it. In 1928, George Stafford Whitby and Morris Katz assumed that the chain growth in the thermal polymerization of indene (and presumably other unsaturated compounds) involved hydrogen migration. However, only within several years of these studies, the mechanism of radical polymerizations was already well understood and it was established that the reactions were comprised of three distinct steps (now termed initiation, propagation, and termination). Papers published in 1934 by William Chalmers, in 1935 by H. Dostal and Herman Mark, and by G. V. Schulz, and in 1937 by Paul Flory described the kinetics of the polymerizations as well as the molecular weight distribution functions of the polymers. The mentioned early studies of radical polymerization will be presented and discussed.
Following the PVC pipeline: Misconceptions and milestones from discovery to industrialization

Evan W. Culver¹, culver.evan@gmail.com, Seth C. Rasmussen². (1) Chemistry and Biochemistry, North Dakota State University, Fargo, North Dakota, United States (2) Department of Chemistry and Biochemistry, North Dakota State University, Fargo, North Dakota, United States

Historical accounts in chemistry have often been subject to biases that lead to incorrect claims and timelines of important scientific discoveries. The story of polyvinyl chloride (PVC) is no exception. One problem that is frequently encountered when telling the history of PVC is who should be given credit for the discovery and when the discovery was made. The confusion frequently arises due to a limited understanding of the macromolecular nature of polymeric materials prior to the 1920s. Additionally, the historical emphasis on plastics often ignores contributions that preceded the patenting and commercialization of polymeric products. The history of PVC is no different in that credit has been incorrectly attributed to industry patents in the early 20th century, along with other erroneous attributions prior to and after the historically accepted account of Eugene Baumann in 1872. It is not to say that the contributions made in the 20th century were not substantial, as without the contributions of Fritz Klatte, industrial scalability would still have been out of reach. The presentation will focus on how PVC made it from a material of only academic interest, to the billion-dollar industry we know today.

History of Poly(organophosphazenes)

Harry R. Allcock, hra1@psu.edu. Chemistry, Pennsylvania State University, University Park, Pennsylvania, United States

The broad field of poly(organophosphazenes) (1) began in 1964 with a chemical reaction that most observers believed was impossible - the replacement by organic nucleophiles of thousands of chlorine side atoms arrayed along an inorganic polymer chain to yield stable macromolecules with unique properties. Today, several hundred different poly(organophosphazenes) with a wide range of unique property combinations have been produced by this technique and by related methods. Applications that utilize the polymers are known that range from biomedical materials, aerospace elastomers, films, membranes, fibers, ionic conductors, and fire-resistant materials, and controlled surfaces, together with block- and graft-copolymers with classical organic macromolecules and silicones. This talk will trace the development of the field and its unique challenges. It is an example of the value of academic research coupled in its early stages with the
involvement of industry, government agencies and laboratories in the search for new property combinations and high technology applications.

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(1)

HIST 18

History vs. legend: Discovery and development of conducting polymers

Seth C. Rasmussen, seth.rasmussen@ndsu.edu. Department of Chemistry and Biochemistry, North Dakota State University, Fargo, North Dakota, United States

The discovery that the conductivity of conjugated organic polymers can be controlled through oxidation or reduction (i.e. doping) has led to organic materials that combine the electronic properties of metals with the weight and density of plastics. For this reason, such materials have been studied extensively and their importance has been recognized with the awarding of the 2000 Nobel Prize in chemistry to Alan Heeger, Alan MacDiarmid, and Hideki Shirakawa “for the discovery and development of conductive polymers.” Due to the wording of this award, as well as other factors, the common view has become that these materials originated with the collaborative work of the Nobel Laureates on doped polyacetylene in the late 1970s. At odds with this view, however, are numerous similar reports of conducting organic polymers dating back to 1963. An overview of the history of conjugated polymers from their origin in 1834 up through the polyacetylene work of the 1970s will be presented, with a focus on the known reports of conducting polymeric materials.

HIST 19

All things Bakelite: Age of plastics documentary film

Hugh Karraker, info@allthingsbakelite.com. All Things Bakelite, Redding Ridge, Connecticut, United States

Most people under the age of 50, who are not in the chemical or plastic industries and not a professor or student of material sciences don’t know what Bakelite is or who invented it. For three years, the film has been enlightening and entertaining both the cognoscenti and the general public about this material and its inventor, Leo H. Baekeland. The film celebrates the first totally synthetic plastic, touches on the negative impacts of plastics and ends with a glimpse into the development of new polymers.
HIST 20

Nifty fifty: Polymer scientists who created the discipline

Gary D. Patterson1,2, gp9a@andrew.cmu.edu. (1) Carnegie Mellon University, Pittsburgh, Pennsylvania, United States (2) Science History Institute, Philadelphia, Pennsylvania, United States

As noted in A Prehistory of Polymer Science, a true scientific community of polymer scientists gelled at the 1935 Faraday Discussion on Polymerization. These men were from many different scientific fields, and from many different countries. But they all chose to commit their time and effort to articulating the paradigm of chain molecules. This talk will detail fifty of them, with more extended treatments of perhaps ten of them. Some from each of the decades since 1890 are included. Some of them are even still alive, like Richard Stein. I have personally met more than half of them in my career both as a polymer scientist and as a historian of the field. A professional length biography of Paul Flory has appeared (and can be purchased).

HIST 21

Staudinger, Sakurada, and the macromolecular debate in the 1930s

Yasu Furukawa, furukawa.yasu0304@gmail.com. Advanced Studies, SOKENDI, Kawasaki, Japan

Ichiro Sakurada (1904-1986) is today widely known as the pioneer in polymer chemistry and synthetic fibers research in Japan. However, he had been a harsh critic of the macromolecular theory proposed by Hermann Staudinger, the founder of polymer chemistry, until the mid-1930s. This paper examines the controversy between Staudinger and Sakurada during and after the latter’s stay in Germany (1928-1931). It also discusses how Sakurada changed his mind and turned out to play a pivotal role in spreading Staudinger’s views in Japan’s chemical community and establishing an institutional basis for polymer science in postwar Japan.
Walter H. Stockmayer and polymer science: Dartmouth years

Jane Lipson, jane.lipson@dartmouth.edu. Chemistry, Dartmouth College, Hanover, New Hampshire, United States

Walter H. Stockmayer was a pioneer in polymer science. He was a scientist who moved with ease from theory to experiment, equilibrium to dynamics, gas phase to melt, gel, solution, and solid, and from city (Boston, MA) to small town (Hanover, NH). Stocky (as he was known by all who really knew him) brought the exciting and relatively new field of polymer physical chemistry to Dartmouth when he arrived from MIT in 1961. His vision for what was noteworthy and exciting was broad, with interests in the Dartmouth years ranging from the statistical mechanics of wormlike chains to quasi-elastic light scattering of linear and branched polymers, to phase separation in complicated polymer mixtures, and beyond. Stocky’s international reputation and connections - aided by his role as one of the founding Associate Editors of Macromolecules – made the Dartmouth Chemistry Department a destination for distinguished visitors and energetic colleagues. His legacy has lived on in polymer science, and also at Dartmouth, where a vibrant program in polymer and materials chemistry is thriving, still. In this talk I will give a sense of the scientific range of Stocky’s work at Dartmouth, highlighting his collaborations with other leaders in the field, connecting those threads to current areas of research. Aside from science, Stocky was a dedicated musician, an avid climber, and someone who deeply appreciated a well-crafted practical joke. I will touch on all of these aspects, as well.

Professor Mihai Dimonie’s contribution to polymer science and the education of many generations of students at the Politehnica University of Bucharest

Mihaela C. Stefan¹, mci071000@utdallas.edu, Mircea Teodorescu², Horia Iovu³, Simion Coca², Gheorghe Hubca², Laurentiu Dinca². (1) Dept Chem UT Dallas, Richardson, Texas, United States (2) Polymers, Politehnica University of Bucharest, Bucharest, Romania (3) Advanced Polymer Materials Group, Politehnica University of Bucharest, Bucharest, Romania

Professor Mihai D. Dimonie was born in Ploiesti (Romania) on January 17, 1934. He received his BS in Chemical Engineering from Politehnica University of Bucharest (Romania) with specialization in the Technology of Organic Compounds. He received his Ph.D. in Chemistry under the supervision of S.S. Medvedev from Lomonosov Moscow Institute of Fine Chemical Technology in 1965. He joined the Department of Organic and Macromolecular Compounds at Politehnica University (Bucharest) in 1957 as Junior Assistant Professor. He was promoted to Assistant Professor in 1965, to Associate Professor in 1969, and Professor in 1980. Professor Dimonie was the Head of the
Department of Technology of Organic and Macromolecular Compounds in the period 1990 to 2004. He was also the Head of Elastomers Department at the National Institute of Chemical Research (ICECHIM) in 1990 and 1991. Professor Dimonie taught Technology of Polymer Synthesis, Ionic and Coordination Polymerizations, Ring Opening Polymerizations, Emulsion Polymerizations, Stereospecific Polymerizations, and Modern Methods for Investigation of Polymerization Processes undergraduate and graduate courses. He advised the dissertation theses of ~200 undergraduate students, and he advised ~30 Ph.D. students in his entire career. The Polymer Technology course he developed and taught for more than 40 years was the most important course for undergraduate students who majored in Chemical Engineering with Polymer Science Specialization. Professor Dimonie published more than 300 papers, four books, and 35 patents in the field of polymer science and technology. He received the Nicolae Teclu Award of the Romanian Academy in 1980 and the Opera Omnia Award from Politehnica University of Bucharest for his entire scientific career. Professor Dimonie published papers in the fields of heterogeneous media polymerizations, ionic and coordination polymerizations, ring-opening polymerizations, composites and nanocomposites, and polymer additives for road bitumen. His most recognized research in the field of ring-opening metathesis polymerization targeted the synthesis of polypentenamer and polyoctenamer elastomers. Professor Dimonie was a role model for students and an outstanding mentor who shaped the careers of many of his students.

HIST 24

Brief history of the Polymer Science and Engineering Department at the University of Massachusetts

Thomas P. Russell, russell@mail.pse.umass.edu. Univ of Massachusetts, Amherst, Massachusetts, United States

Eleven years after joining the Chemistry Department at the University of Massachusetts at Amherst, Richard S. Stein formed the Polymer Research Institute in 1961. William MacKnight then joined in 1965 and in the following year, Roger Porter was hired to chair the newly formed Polymer Science and Engineering Program. The program continued to grow, being awarded a Materials Research Laboratory from the NSF, probably one of the most significant factors that allowed the program to elevate the program to the department level in 1974 in the College of Natural Sciences and Mathematics. Since that humble beginning the Polymer Science and Engineering Department has and continues to excel in performing forefront research in polymer science, being competitive with materials science departments internationally, becoming a National Center for Polymer Research in 1991. This experiment, begun at a time when polymers was not a popular academic discipline, but rather thought primarily of importance in the industrial sector, has turned into a remarkable success.
HIST 25

Origin and development of polymer science in India: Historical perspectives

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Polymer science as a discipline took roots in India in the early 1950s, almost concurrently with the birth of this discipline in many other parts of the world. From its small beginning, polymer science has grown into a vibrant discipline practiced, in both, industry and academia in India. This talk will trace the origins and the early pioneers who established this discipline in India. Many of these early pioneers received their training in Brooklyn Polytechnic under the most venerable Hermann Mark. 1970s saw the birth of Indian polymer manufacturing and processing industry, which continues to grow in double digits even today. In the early 2000s, several global companies set up their R&D Centers in India in the area of polymers, to take advantage of the large pool of talent available in this discipline in India. This talk will highlight the drivers for the growth of the discipline in its early years and what sustains this discipline today. Major themes of current research in the area in both, academic institutions as well as industry in India, will be described.

HIST 26

Chemical philately and a stamp collector's view of polymer science

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This presentation will rely on the use of postage stamps to illustrate the history of polymer science, starting with natural polymeric materials known for centuries, such as silk and caoutchouc. Milestones in the development of early polymer chemistry will be described, including the work of Schönbein on nitrocellulose, Chardonnet's production of artificial silk, the beginning of the textile industry, and the vulcanization of rubber. Contributions from key personalities in the history of plastics, such as Baekeland, Staudinger, Flory, Ziegler, and Natta, will also be discussed. Last but not least, an array of fascinating topics that are (unexpectedly) found on postage stamps will be presented, for example hydrogels and the pioneering research of Otto Wichterle, the introduction of plastic banknotes, and the discovery of conductive polymers.
Invention of the GC-MS

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The history of the GC-MS, as the coupling of a gas chromatograph and mass spectrometer is called, recalls a time when both gas chromatography and mass spectrometry were in their infancy. It was a time of rapid innovation, with methods and equipment in flux. Today, it is hard to imagine an analytical lab without a GC-MS. The analytical power unleashed by combining chromatographic separation with positive mass spectral identification is compelling. On June 8th, 2019, Midland, Michigan became a National Historic Chemical Landmark recognizing the invention of this important technology. Dow researchers Fred McLafferty and Roland Gohlke demonstrated the first pairing of gas chromatography with mass spectral detection in the winter of 1955. GC-MS is now one of the most widely deployed, most powerful technologies in the analytical chemist’s toolbox.

Coupling of GC separation with MS identification
**HIST 28**

Advancements in chromatography and mass spectrometry for detecting the use of performance enhancing drugs at the Olympic Games

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Throughout its history, the Olympic Games have been promoted as a means of bringing the youth of the world together in athletic competition with the goal of building a peaceful and better world. Nevertheless, many countries used this platform to propagandize their political ideologies. Many nations fueled their athletic successes by the use of chemical enhancements. Even after the fall of the Iron Curtain, athletes from all over the globe continue to utilize performance enhancing drugs (PEDs) as prize money, performance fees, and endorsements have inundated traditionally amateur sports. This project continues the investigation of the influence analytical chemistry has had on the Olympic Games. Specifically, the advancement over the past forty years in chromatography and mass spectrometry used to detect PEDs will be addressed.

**HIST 29**

Drugs that shaped the FDA from elixir sulfanilamide to thalidomide

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The United States Food and Drug Administration (FDA) currently regulates pharmaceuticals, medical devices and food products. Since the inception of the FDA in 1906, two key pieces of legislation have shaped the FDA into the organization that we recognize today: The Federal Food, Drug and Cosmetic Act (FD&C Act) of 1938 and the Kefauver-Harris amendment in 1962. The FD&C Act of 1938 gave the FDA authority to oversee the safety of food, drugs and cosmetics. The law authorized the FDA to require evidence of safety for new drugs, issue standards for food, and conduct factory inspections. The Kefauver-Harris amendment to the FD&C Act in 1962 required each new drug application (NDA) contain evidence from “adequate and well-controlled studies” demonstrating that a new drug was effective for its intended use and that the established benefits of the drug outweighed its known risks. Companies were required to present animal studies to the FDA before obtaining approval to test on humans. Furthermore, clinical studies on humans required informed consent from participants. Each of these pieces of legislation dramatically shaped the FDA and the pharmaceutical industry in the United States (US). They were the product of mounting consumer activism and political pressure, and they were ultimately pushed to passage by high-profile medical disasters: elixir sulfanilamide in 1937 and thalidomide in 1962.
HIST 30

Withdrawn

HIST 31

Use of a graph database to explore the history of chemistry: Chemistry of history

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A graph database of people, places, publications, and ideas in the history of chemistry has been developed and coupled to a physics engine for visualization and exploration. In addition to the immediate ability to explore the spatiotemporal progress of the development of chemistry, this database allows the history of chemistry to be explored by techniques analogous to those used to study chemistry itself. By representing the concepts and people as atoms or functional groups, the history of chemistry can be viewed as having a structure analogous to that of a crosslinked polymer. The use of a physics engine allows heuristic models to be used to explore the connections among people, places, and ideas, which allow the investigation of long-reaching connections invisible to cursory analysis. Techniques modeled after 2-D spectroscopies can be used to look at couplings between well-separated ideas or developments. Methods developed for molecular dynamics studies of polymers can be used to assess the long-range (in space or time) effects of individual ideas or influences. This database method is also of interest in integrating a history of chemistry class into the curriculum, where direct links can be made between the methods used in both cases. Students can be exposed to concepts of data science which are hard to incorporate into the rest of the chemistry curriculum.

HIST 32

Artists’ perspectives on the history of chemical disasters

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This study explores how visual art can be used to chronicle and examine the history of some well-known chemical disasters that have occurred during the past two hundred years. A series of contemporary paintings illustrating chemical accidents and disasters such as the Exxon Valdez oil spill and the Halifax Explosion are examined and explained.
The presentation will review how this approach fits in with more traditional chemical iconography and visual representations of chemical history, the chemical industry, and chemical processes. It also emphasizes new ways in which historians, chemists and other scientists can engage each other and the public through the fine arts.

Chemical Disasters - "The Exxon Valdez"

HIST 33

Manufacturing white lead in the new republic: Review of the Wetherill's stack process

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The production of white lead, an important paint pigment, was one of the early American chemical industries residing in early 19th century Philadelphia. Samuel Wetherill & Sons, "...Druggists as well as Oil and Colour Men," built the first factory to manufacture white lead in 1804. Overcoming considerably start-up challenges, the Wetherill company became a leading national manufacturer of white lead and other pigment products until it was acquired by National Lead in 1931. The stack process initially used by the Wetherills will be reviewed, along with some modern variations of the process.
Indigo plantation in India: Connecting history with chemistry

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Indigo is an organic compound whose uses have been predominantly utilized in colonial India by the British Empire. Referred to as “blue gold,” it incited the Indigo revolt in 1859 in Bengal, India due to the mistreatment of the workers designated to extracts the precious substance. Due to the attention this event garnered and the evident success of the indigo market from the fertile lands of India, sources of indigo have continued to be cultivated and the country is considered one of the indigo dyeing centers of the world, with more than 2700 square miles dedicated to such by the end of the 19th century. Indigo is derived from a compound known as indican, which can be obtained from tryptophan. One of the products of the hydrolysis of the compound indican is indoxyl, which can be further oxidized to achieve the final product of indigotin. In regards to the chemistry of indigo, the substance is insoluble in water and must undergo reduction in achieve the desired hue that is valued for. In terms of practical extraction, the fabric with which the indigo is contained is immersed in water, and the compound’s exposition to oxygen allows for the reversion to an insoluble, colored form of indigo. While indigo can be found naturally, synthetic indigo is a form that has been utilized to a great extent in the modern era for uses in textiles and other materials. During this presentation some historical data including the laboratory synthesis of the indigo blue will be discussed.

Ski wax: Skier's edge in extracting competitive advantage

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The confluence of factors that affect ski performance are quite varied and include the ski stiffness and dimensions, the relative grooming of the slope, the weight and balance of the skier, the temperature and other environmental conditions of the surfaces, the type of skiing being executed and the hardness and ablative capacity of the wax constituents that as the lubrication between the skier and the mountain. There are quite different requirements for waxes to perform in sprint type-functions like ski jumping where the sliding distance is very short vs endurance events such as biathlon and cross-country and distance races. In this fun, little diversion, I will present details about the historical design requirements for ski waxes, the types of ski waxes that have evolved from
paraffinic and perfluorinated substances to other polymeric structures and combinations thereof. I will also explain the mechanics of lubrication in different regimes of skiing, and provide some insights on how analytics and instantaneous weather tracking are contributing to real time wax selection and application. The ability for waxes to crystallize and their hardness once formed are key factors regulating how easily these are abrasively worn off of the skis with sliding distance. There may be a separate racer-to-racer distinction in sequential races (e.g. ski-jumping, slalom) where the wax wear debris from a previous racer can alter the coefficient of friction of the ski slope as the next racer goes down. The bottom line is that in recent history, wax selection has been the major delineator in performance in olympic venues.

HIST 36

Superphosphate and the development of industrial chemistry at Newtown Creek in 19th century New York

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The bond between industrial chemistry and agriculture began with the bones of dead animals. Bones are composite materials consisting of a continuous organic phase, mainly collagen, interspersed with a discrete clusters of inorganic material, mainly carbonated hydroxyapatite, a form of calcium phosphate. In nature, phosphate is cycled between flora and fauna: plants need phosphate to grow, to make DNA and RNA and the smaller molecules that store and provide energy; the bones of dead animals provide the phosphate plants need to thrive. Plant phosphate is returned to animals that consume plants. Plants are nurtured as farmers spread ground bone on growing fields. Grinding bone improves the availability of bone phosphate to plants, but sulfuric acid does a better job of it. Animal bones are phosphate-rich, but phosphate rock is even richer. Just as sulfuric acid can free phosphate from crushed bones, it can free the phosphate in phosphate rock. Phosphate freed from its bound state by sulfuric acid came to be called “superphosphate.” As demand for superphosphate fertilizer grew, demand for sulfuric acid grew. A reliable supply of sulfuric acid, in turn, made petroleum refining possible. This talk concerns superphosphate and the development of industrial chemistry in New York harbor in the middle years of the 19th century.