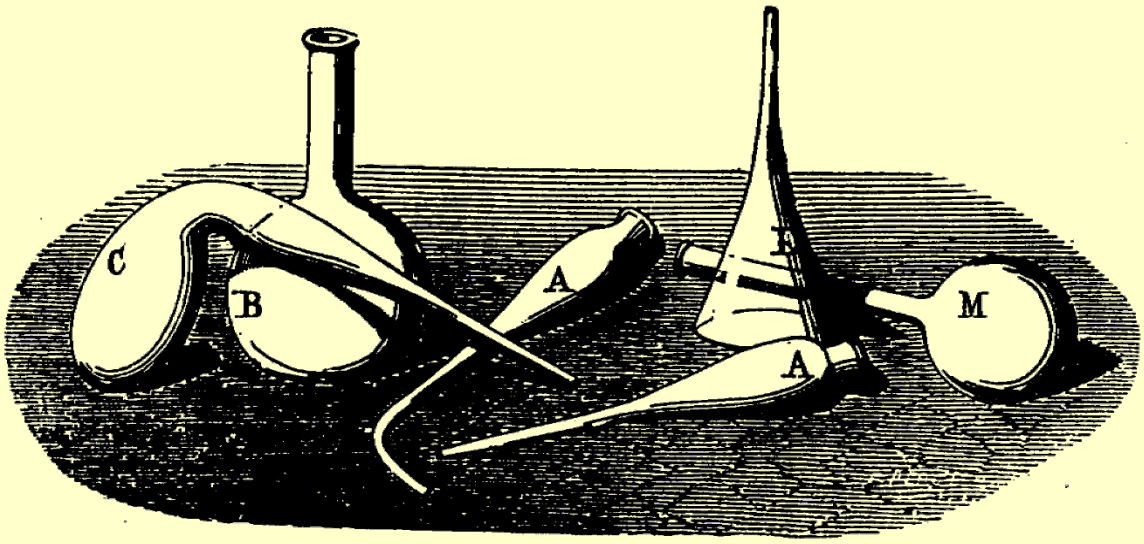
American Chemical Society

DIVISION OF THE HISTORY OF CHEMISTRY



NEWSLETTER, PROGRAM & ABSTRACTS

Fall 2023 ACS National Meeting
San Francisco, CA (Hybrid)
August 13-17, 2023

Nicolay V. Tsarevsky, Program Chair

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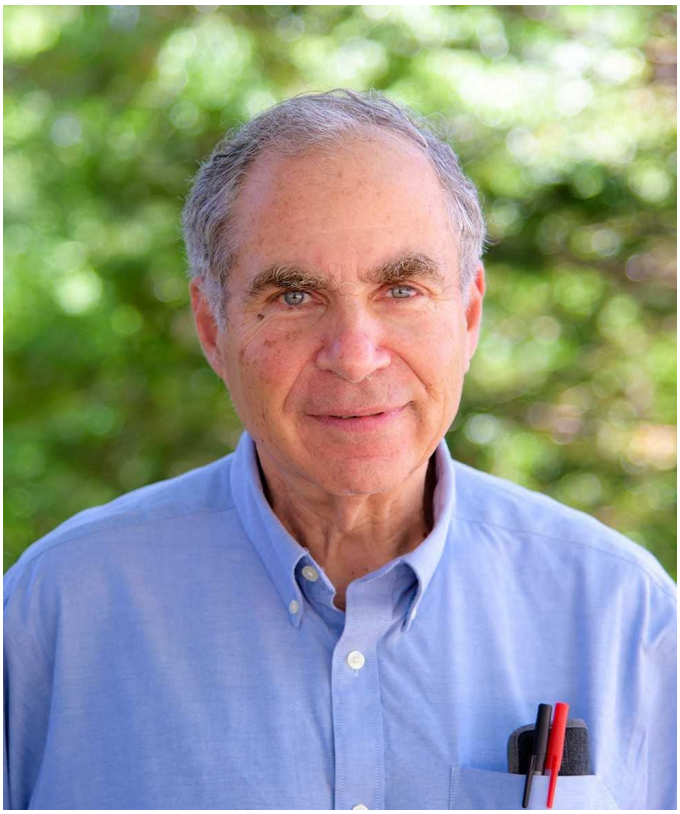
Mission Statement

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



This is both an exciting and a challenging time for our HIST Division. We are very proud that the 2023 Joseph B. Lambert HIST Award will be shared by the amazing team of Geoffrey and Marelene Rayner-Canham for their valuable and comprehensive studies of the history of women in chemistry. On Tuesday, August 15, 2023 a full-day symposium, at the New Orleans meeting, on women and chemistry will further honor their career-long work. It will be an exciting symposium; please consider signing up for the dinner that evening. If you have not recently visited the HIST website (http://acshist.scs.illinois.edu/) I encourage you to do so. It is an amazing resource.

Thanks for the dedication of those who recently served and are currently serving on the Paul R. Jones Outstanding Paper Award (*Bulletin for the History of Chemistry*). Their hard work finally brought the OPA Award up to date. The last three awards, preceding the most recent two, were presented to: Seth Rasmussen (2018), David Lewis (2019) and William Streifer (2020). Recall each award considers the three most recent years together, e.g., 2018, 2019, 2020 as a group for the 2020 award. The two most recent awards are:

2021: Dean F. Martin, Vera V. Mainz, and Gregory S. Girolami, "St. Elmo Brady (1884-1966): The First African American Chemistry Doctoral Recipient", *Bull. Hist. Chem.* **2021**, *46*, 83-107.

2022: Charles S. Weinert, *Die Chemie ist Schwierig*: Winkler and the Discovery of Germanium," *Bull. Hist. Chem.* **2020**, *45*, 8-15.
Special thanks to Professor Natalie Foster, Ned Heindel's Lehigh University colleague , requested on short notice by Ned, from his hospital bed, to replace him on the OPA Committee. (More on Ned later).

Jeff Seeman initiated the Citation for Chemical Breakthroughs Award in 2006. The 2023 plaques were awarded for Johannes Nicolaus Brønsted's 1923 paper defining acids and bases, the 1939 paper by Otto Hahn and Fritz Strassmann reporting nuclear fission, and the 1939 paper by Lise Meitner and Otto Robert Frisch describing the nature of nuclear fission. Readers are encouraged to visit the HIST website that lists previous awards and consider submitting nominations.

Our Division is embarking on its first formal Strategic Planning activity since 2008. Preceded by a few Zoom sessions, a full-day meeting of the Strategic Planning Committee is scheduled for March 15, 2024 in New Orleans prior to the National ACS Meeting. This is a slight departure from the standard one and one half day meeting, thanks to the ability to employ Zoom pre- and post-meeting. It is an opportune moment as ACS itself evolves, has concerns about diminishing enrollments, and seeks to encourage more inter-divisional activities and symposia as well as additional industrial participation. Our division has just endured the loss of one of our two councilor positions and we seek new inter-divisional collaborations and new members willing to take leadership positions and organize symposia. Our Strategic Planning Committee includes Ana Bettencourt-Dias, Sibrina Collins, Roger Egolf, Carmen Giunta, Art Greenberg, Christine Hahn, Joe Jeffers, Kristine Konkol, Dave Lewis, Vera Mainz, Seth Rasmussen, Mihaela Stefan, and Nick Tsarevsky.

With sadness and great respect, we note the passing of Dr. Ned Heindel (September 4, 1937- June 27, 2023). Ned spent most of his career as a faculty member at Lehigh University, starting in 1966 and appointed Emeritus Professor in 2018. He supervised 40 Ph.D. students (including our own Roger Egolf), 168 M.S. students, generating over 300 refereed papers and 20 patents, serving as HIST Chair (1978 and 2013-14), a member of the ACS Board of Directors, ACS President (1994), as well as on other prestigious boards. But numbers do not come close to characterizing the man- a kind, gentle yet driving "force of Nature". He and Linda donated 128 acres of preservation land to Northampton County in Pennsylvania as part of their environmental activism. We wish Linda and the extended family peace and strength.

Given our August venue, I note the recent passing of Tony Bennett whose masterpiece "I Left My Heart in San Francisco" was released sixty years ago. He gained early advice from Frank Sinatra and performed toward the end of his career with Lady Gaga. We look forward to seeing you in the "City on the Bay". Safe travels.

Arthur Greenberg, HIST Chair

Report of Councilors, Division of the History of Chemistry
Spring 2023 ACS National Meeting, Indianapolis, IN – Hybrid Council Meeting (March 29, 2023)

Actions of the Council

1. Elections Results

Candidates for President-Elect, 2024

By electronic ballot, the Council selected **Dorothy J. Phillips** and **Florian J. Schattenmann** as candidates for 2024 President-Elect. These two candidates, along with any candidates selected via petitions, will stand for election in the Fall 2023 National Election.

Candidates for District III and VI
The Committee on Nominations and Elections announced the results of the election held prior to the hybrid Council meeting; to select candidates from the list of nominees for Directors from District III and District VI on the Board of Directors for the term 2024-2026. By internet ballot, the Councilors from these districts selected **Diane Krone** and **Helen (Bonnie) A. Lawlor** as District III candidates, and **Janet L. Bryant** and **Jeanette M. Van Emon** as District VI candidates. Ballots will be distributed to members residing in District III and District VI around October 1, 2023, for election of a Director from each District.

Candidates for Directors-at-Large
The Committee on Nominations and Elections announced the selection of the following candidates for Directors-at-Large for the 2024-2026 term: **Wayne E. Jones, Jr., Daniel Rabinovich, Carolyn Ribes,** and **Joseph P. Stoner.** The election of two Directors-at-Large from among these four candidates and any selected via petition will be conducted in the fall. Ballots will be distributed to the Council around October 1, 2023.

Committee on Committees (ConC) Election
By electronic ballot, the Council elected **Daniel Rabinovich** for a two-year term (2023-2024) on the Committee on Committees (ConC).

2. Other Council Actions
Highlights from Committee Reports and Key Actions
- On the recommendation of the Council Policy Committee (CPC), Council approved the Petition to Amend the Duties of the Council Policy Committee to authorize CPC to review the conduct of Councilors.
- As required by the ACS Governing Documents, CPC has set the divisor for Local Section and Division representation at Council for the period 2024-2027. The formula is based on membership numbers as of December 31, 2022. Notification will be sent by the Secretary to all affected units by May 1, with details on how they will be impacted.
- CPC reviewed the Councilor Expense Program and voted to approve a streamlined process for fall 2023. The committee also voted to review further streamlining options for the program going forward.
- On the recommendation of the Committee on Committees (ConC), and with the concurrence of the Council Policy Committee, Council approved the Petition to Amend the Duties of the Committee on Environmental Improvement to change the name of the committee to the Committee on Environment and Sustainability.
- ConC announced that the opening of the online preference form to all ACS members begins on April 3 and will run through July 3. Councilors interested in serving on an ACS Committee in 2024 should go to CMTE.acs.org to complete their preferences.
- On the recommendation of the Committee on Nominations and Elections (N&E), and with the concurrence of the Council Policy Committee, Council approved the Petition to Add Plan B to Council Meetings, which authorizes the postponement of voting at Council in case of technology failures or natural disasters.
- N&E reminded Councilors that any petition candidates to ACS National Office must certified by the July 15 deadline to be placed on the ballot this fall.
- On the recommendation of the Committee on Membership Affairs (MAC), Council approved the 2024 Schedule of Membership.
- The Committee on Local Section Activities (LSAC) announced the launch of the ACS Speaker Directory, a new resource for our component group leaders to access a wide range of speakers for their in-person, hybrid, and asynchronous events.

- The Committee on Meetings and Expositions (M&E) is actively engaged in collaborative efforts to re-imagine ACS meetings, targeting increased value and relevancy. Councilors can expect to receive more information on the Future of Meetings project in the coming weeks, starting next month with the M&E Chair comment in C&EN.

Council Special Discussion

President Giordan introduced and led a special discussion on the ongoing review of Society Committees. She sought Councilor input of positive ideas, key issues, and opportunities to improve the structure of committees.

Four specific prompts were posed to Councilors for their input and suggestions:

1. Ideally, for ACS to have a committee structure that is forward thinking and able to address opportunities for members, ACS and the chemistry enterprise, we would…
2. Current and future key issues impacting ACS, the chemistry enterprise and our committees include…
3. I wonder what the positive impact on committees, member involvement, and ACS would be if we were to…
4. I wish that committees at ACS could…

Councilors provided their ideas and thoughts, and relevant Society units will receive this input within the next several weeks.

3. Resolutions

- In memory of deceased Presidents Brian M. Rushton and Dr. S. Allen Heininger.
- In memory of deceased Councilors Yorke E. Rhodes and Maurice M. Bursey.
- In sincere appreciation of the Indiana Local Section, host Section for the spring 2023 ACS meeting

The spring 2023 meeting was held in a hybrid manner from March 26-30. As of March 29, there were 12,623 registrations (10,792 in-person and 1,831 virtual). Note: 6.6% of the participants were virtual in comparison with 19.5% virtual participants for the previous ACS National Meeting.

<u>HIST Councilors</u>

Mary Virginia Orna is serving as a member of the Senior Chemists Committee (SCC) and of its Executive Committee. She serves as the Champion on Tutorials for the SCC Inreach Subcommittee. She also serves as Co-Chair of the Partnerships Subcommittee and the Co-Champion of the Undergraduate Networking Activity. (These are all newly designated divisions of labor following the fall Strategic Planning Workshop.)

Roger Egolf is serving as a member of the Meetings and Expositions Committee (M&E) and its Operations and Finance Subcommittee. This subcommittee is charged with looking at the finances of National meetings and reviewing the choice of locations for the meetings. At the San Francisco meeting, he will be participating in a strategic planning session for the full committee.

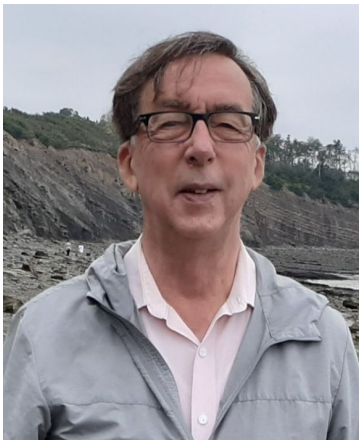
Prepared and submitted by Mary Virginia Orna and Roger Egolf, HIST Councilors

News and Announcements

Awards

Jospeh B. Lambert HIST Award

As announced in the spring 2023 issue of the Newsletter, the winners of the ***Jospeh B. Lambert*** HIST Award for Excellence in the History of Chemistry for 2023 are Marelene F. and Geoffrey W. Rayner-Canham for their work on the history of women in science, with particular focus on British female chemists.



Geoffrey Rayner-Canham was born and educated in England. He received his B.Sc. in Chemistry from the University of London in 1966, his Diploma of Imperial College (D. I. C.) from Imperial College in 1969, and his Ph.D. in Inorganic Chemistry (advisor Dr. Margaret Goodgame) from the University of London in 1969. He is currently Professor Emeritus at the University of Newfoundland and Labrador.

Marelene F. Rayner-Canham was also born and educated in England. She received her B.Sc. in General Science from the University of Waterloo, Ontario in 1986. She taught laboratory physics at the University of Newfoundland.

The saga that led to the HIST Award started in the 1980s when they noticed a remarkable Canadian woman, Harriet Brooks, while reading the classic work, *Discovery of the Elements* by Mary Elvira Weeks (and her final collaborator Henry M. Leicester). The extensive research into her career resulted in the book: *Harriet Brooks – Pioneer Nuclear Scientist* (1992).

The research into the life and work on Harriet Brooks also revealed other neglected women scientists: Fanny Cook Gates, Ellen Gleditsch, Jadwiga Szmidt and May Sybil Leslie. This project resulted in the book: *A Devotion to their Science: Pioneer Women of Radioactivity* (1997). This was then followed with a more targeted focus on women in chemistry, which resulted in the book: *Women in Chemistry: Their Changing Roles from Alchemical Times to the Mid-Twentieth Century* (1998). Another major effort in this area produced: *Chemistry was Their Life: Pioneering British Women Chemists, 1880-1949* (2008). Lastly, the Rayner-Canham team was also a major contributor to the European project and book: *Women in their element: Selected women's contributions to the periodic system* (2019).

The Rayner-Canhams have published a large number of papers in the *Bulletin for the History of Chemistry*. A recent paper on a pioneering female crystallographer (*Bull. Hist. Chem.* **2021**, *46(1)*, 68-82) is typical in that it brings to our attention the life and achievements of a woman who deserves to be remembered, but who was forgotten prior to their investigation.

A short Award biography cannot adequately present the importance of this work. The praise by the nominators can help put their accomplishments into perspective.

Anne Johnson, Ryerson University: "*Geoff and Marelene should be recognized for the depth and breadth of their original research, which has often involved tracking down obscure sources, combing through school archives in attics, and reading lifetime correspondences in order to paint complete pictures of the lives of the women they researched. Their writing is remarkable in that it is engaging and easy to read. They have included quotes contemporary to their subjects to bring these forgotten women to life.*"

Eric Scerri, UCLA: "*It is not just the comprehensiveness of their research, but also their delightful writing style which makes reading their work so appealing. Whatever the topic might be, the*

Rayner-Canhams find quotations, which provide a sense of contemporary personal experience in the context of the research topic."

Annette Lykknes, NTNU (Norwegian University of Science and Technology) and Brigitte Van Tiggelen, Science History Institute: "*Indeed, Marelene and Geoff's work has had an impact in the chemical community and beyond. Their successive publications (40 articles and contributions, and 8 books) and numerous lectures have made chemists aware of events and actors in the development of their field [who] were mostly unknown. In particular, these have allowed more and more chemists, even those not particularly interested or versed in history to get to know more about female chemists from the past, in a language that was close to them. The fact that ACS commissioned the volume Women in chemistry mentioned above is an acknowledgement of this influence on the chemical community. The impact however goes far beyond, as Harriet Brooks about whom hardly anything was known in the sciences and absolutely nothing in the general public in the beginning of 90's is now a well-known figure in the history of Canadian women in Canada. This is an impressive achievement which also serves the inclusion of science in the national history and heritage as well as the multiplication of feminine figures that can be referred to as role-models for girls and women in science."*

Submitted by Gary Patterson

Bulletin of the History of Chemistry Paul R. Jones Outstanding Paper Awards

The Paul R. Jones *Bulletin for the History of Chemistry* Outstanding Paper award (OPA) is given yearly for the best paper published in the Bulletin in the award year and the two preceding years. For the 2021 award, papers from 2019, 2020, and 2021 were judged and the best paper from those three years selected as the winner. For the 2022 award, papers from 2020, 2021, and 2022 were judged.

The 2021 OPA winners are Dean F. Martin, Vera V. Mainz and Gregory S. Girolami for the paper "St, Elmo Brady (1884-1966). The First African American Chemistry Doctorate Recipient" (*Bull. Hist. Chem.* **2021**, *46 (1)*, 83–107).

Dean F. Martin, Professor of Chemistry Emeritus, at the University of South Florida received a B.A. with honors from Grinnell College in 1955, and a Ph.D. in Chemistry from Penn State under W. Conard Fernelius in 1958. He was an NSF Post-doctoral fellow at University College London (1958-59) before joining the faculty of the University of Illinois as an instructor in inorganic chemistry (1959-61) and assistant professor of inorganic chemistry (1961-64). He became an associate professor chemistry at the University of South Florida (1964-69), and a full professor (1969-2006) before being named a distinguished university professor (1993). Prior to retirement in 2006, he taught courses in three different colleges of USF, including courses such as General Chemistry, Inorganic Chemistry, Chemical Oceanography, Environmental and Health Chemistry, Searching the Chemical Literature, and finally Historical Perspectives of Chemistry. Following retirement, he remained an active researcher studying the role of coordination chemistry in areas of environmental interest. He also serves as a fund raiser on behalf of student support. He and his wife, Barbara Bursa Martin, have created 12 endowments at USF.

The husband-and-wife team of Vera V. Mainz and Gregory S. Girolami are the other authors on the winning paper. Dr Mainz is well known to the HIST community, having continuously served HIST as Secretary-Treasurer of the Division since 1995. She took her B.S. degrees in chemistry and mathematics in 1976, and moved to the University of California at Berkeley, where she took her Ph.D. working with Prof. Richard A. Andersen. She is retired from her position as Director of the NMR Laboratory at the School of Chemical Sciences, University of Illinois at Urbana–Champaign. She received her B.S. degrees in chemistry and mathematics from Kansas Newman University and her Ph.D. degree from the University of California at Berkeley. In 2012, she was elected a member of the 2013 Class of ACS Fellows. She has been very active in organizing HIST symposia and then editing the published proceedings.

Gregory S. Girolami is the William H. and Janet G. Lycan Professor of Chemistry at the University of Illinois at Urbana-Champaign, where he has twice served as the Head of the Chemistry Department. He received his B.S. degrees in chemistry and physics summa cum laude from the University of Texas at Austin and his Ph.D. degree in 1981 from the University of California at Berkeley, working with Prof. Richard A. Andersen. Thereafter, he was a NATO postdoctoral fellow with Nobel Laureate, Sir Geoffrey Wilkinson at Imperial College of Science and Technology in South Kensington, London, and

joined the Illinois faculty in 1983. His research interests are primarily the synthesis, properties, and reactivity of new inorganic, organometallic, and solid-state species. He has published over 250 papers and several books.

The Mainz-Girolami team are collectors of rare books in chemistry.

The 2022 OPA winner is Charles S. Weinert for the paper "Die Chemie ist Schwierig: Winkler and the Discovery of Germanium" (*Bull. Hist. Chem. 45 (1)*, **2020**, pp. 8-15).

Charles Scott Weinert, Professor of Chemistry at Oklahoma State University, is originally from Detroit and did his undergraduate studies at the University of Michigan where he graduated in 1995. He went to work for Selective Technologies, Inc. which is a startup company founded at UM. He began graduate studies at the University of Chicago in 1996 where he obtained an M.S. degree in 1997 and then moved to Northwestern University. After obtaining a Ph.D. from Northwestern in 2000, he became a Postdoctoral Research Fellow at Purdue University. He joined the faculty of the Chemistry Department at Oklahoma State University in 2004. His research has focused on the synthesis and characterization of oligogermanes, including those having linear, branched, and cyclic geometries. His research group is currently focused on preparing hepta- and longer-chain oligogermanes in order to ascertain whether these molecules will exhibit new and useful optical and/or electronic properties. In addition to his chemistry work, he is a musician, and has been playing electric bass guitar for nearly 30 years. He has recorded several songs with the Detroit-based band Electric Six and has also played in a few bands of his own over the years. He lives in Edmond, Oklahoma with his wife Christa and son CJ.

Submitted by David E. Lewis and Ron Brashear

HIST Fellows (2023)

As previously announced, the division has recently added the designation of *HIST Fellow* to its ongoing HIST awards programs. This new award recognizes HIST members who have made a significant impact on the advancement of history in the chemical sciences, as well as dedicated service to the division. For the 2023 class, the following members have been selected as HIST Fellows:

Vera V. Mainz
Seth C. Rasmussen
Alan J. Rocke

The award consists of a certificate and a special HIST Fellow pin. The inaugural 2022 class of HIST Fellows were previously announced in the Newsletter and are now listed on the HIST website. HIST Fellows will continue to be awarded yearly and will be given out as part of the annual HIST Awards Banquet. Full information on the new award is now available via the HIST website under the Divisional Awards tab.
For those wishing to nominate members for the 2024 class, please see the HIST website for nomination details. The deadline for 2024 nominations will be December 31, 2023. Please consider nominating a deserving colleague.

The Partington Prize for 2023

The Society for the History of Alchemy and Chemistry is delighted to announce that the winner of the 2023 Partington Prize is Dr Armel Cornu of the Science History Institute for her entry "Senses and utility in the New Chemistry."

Armel Cornu is a postdoctoral researcher at the Science History Institute in Philadelphia. She majored in chemistry and history before graduating with a masters degree in the history of science at Université Panthéon-Sorbonne in Paris. She obtained her doctorate at the University of Uppsala in 2022 with a dissertation focusing on the market, regulation, and science of mineral waters in eighteenth-century France. Her research is characterized by a social and economic approach to the development of chemistry throughout the Enlightenment. She currently works on the uses of sensorial impressions in the practice and perception of eighteenth-century chemistry.

The Society for the History of Alchemy and Chemistry established the Partington Prize in memory of Professor James Riddick Partington, the Society's first Chairman. It is awarded every three years for an original and unpublished essay on any aspect of the history of alchemy or chemistry. The prize-winning article will appear in the Society's journal, *Ambix,* in due course.

Events and Activities

Making Archeological Ink

On Thursday, June 8, 2023, HIST Councilor, Mary Virginia Orna, visited the John Cardinal O'Connor School in Irvington, New York, whose mission is to empower students with learning differences. Here she conducted a "Making Archaeological Ink or Making Ink with Tea" activity with three different student groups, each containing, on average, about 16 students. These in-person sessions followed very closely the activity that she and HIST members Patricia Smith and Seth C. Rasmussen had developed for National Chemistry Week in 2019. The activity involved observing the reaction of the tannins contained in freshly brewed tea with an iron salt, iron(II) sulfate. The iron and tannins form complex compounds that are water soluble and are dark blue-black in color; upon exposure to oxygen in the air, the complex becomes darker and insoluble, producing a permanent ink.

Pliny the Elder (1st century CE) described how addition of an iron salt solution to parchment soaked with oak-galls (growths rich in tannins found on the underside of oak leaves) could darken it. Over the course of the next four or five centuries, this idea took hold as the basis for an iron-gall-based ink. From about the mid-fifth century CE on, metallic inks became the general rule particularly since parchment required a more adhesive writing medium and the iron gall ink was easy to manufacture and use. Today, the great libraries of the world contain thousands of documents written with iron gall ink, which was in common use up until the middle of the 20th century.Historically, this ink was used to produce such iconic documents as the Magna Carta, the Declaration of Independence and Milton's "Paradise Lost."

The students learned that a chemical reaction could take place when two substances are mixed together and that the evidence of reaction was a color change. In comparing the reaction vessel containing the tea plus iron salt with an identical vessel containing the unreacted tea, they learned the concept of a "control" in conducting a scientfic activity. The students then painted with the ink and noticed that it continued to darken over time and that small black grains appeared as a precipitate, thus illustrating that chemical reactions take time to reach completion.

Wearing a lab coat labeled "American Chemical Society" and a large pair of safety goggles created an effect on the students. Emphasizing safety, especially eye safety, was an easy sell and pretty much all the students kept their own safety goggles on without much urging.

In actuality, the reaction described is quite complex: gallic acid (derived from tannic acid) reacts with iron(II) to produce a colorless, water-soluble intermediate monogallate compound, gallatoiron(II). When this proto-ink stands for a while or is applied to paper, it subsequently is oxidized with concomitant loss of water to produce a permanent dark-blue-black insoluble compound, bis(gallato)diiron(III).

For further reading:

1. Eichholz, D. E.; Jones, W. H. S.; Rackham, H. *Pliny the Elder, Natural History*; Harvard University Press: Cambridge, MA; 1938
2. Heth, C. The Skin They Were In: Leather and Tanning in Antiquity. In Rasmussen, S. C., ed. *Chemical Technology in Antiquity*; ACS Symposium Series Volume 1211; American Chemical Society: Washington, DC, 2015; pp. 181-196
3. The Iron Gall Ink Website. https://irongallink.org/igi_index.html (accessed Feb. 21, 2019).
4. Krekel, C. Chemische Struktur historischer Eisengallustinten. In Banik, G.; Weber, H., eds. *Tintenfrassschäden und ihre Behandlung*; Kohlhammer: Stuttgart, 1999; pp. 25-36.
5. Wilson, H. Analysis of the Current Research into the Chemistry of Iron Gall Ink and its Implications for Paper Conservation. Master's Thesis, St. Anne's College, Oxford, 2007; DOI: 10.13140/2.1.4803.2000.
6. Wunderlich, C. H.; Weber, R.; Bergerhoff, G. Über Eisengallustinte. *Z. anorg. allg. Chemie* **1991**, *598*, 371-376.

Submitted by Mary Virginia Orna

HIST News

Historian's Report for Fall 2023

2023 has been a busy year. One of the joys of being the HIST Historian is the frequent request to either talk or write on subjects of local interest around the world.

A major paper, *"A Taxonomy of Transdictions: Medical, Crystallographic and Chemical Types,"* was submitted to the *British Journal for the History of Science*. The first author is Carmen Schmechel from the University of Berlin. This work was also presented to the AD HOC discussion group at Cambridge University on March 13, 2023.

A review of the new book by Catherine Jackson, *Molecular World: Making Modern Chemistry,* will appear in the next issue of the *Bulletin*. This groundbreaking book about the evolution of 19th century synthetic organic chemistry is well worth the effort to read it.

A chapter in the HIST History of HIST has been written about F.W. Clarke. Carmen Giunta and I are planning a full symposium about him for Fall 2025.

The current book project is called *Heat Flows from a Hot Body to a Cold Body: A History of Heat.* 20 chapters have been written and the full book should be done by the end of 2023. The scientists associated with the subject of heat are fascinating as a group. The time frame is from the 17th to the 20th century. My own favorite is Leon Brillouin. While many chemists have never heard of him, he is one of the Fathers of Chemical Physics. He was born and educated in France, but fled to America to escape the Vichy regime. He helped to found the field of Information Science and determined the number of bits associated with entropy!

While I am willing to serve as Historian for the next few years, now is a good time to think about the next person to adopt this role. There have only been two official historians. The two fixed tasks are preparing the biographies for the HIST Award winner and the Best Paper awardee. As the last decade has revealed, the HIST Historian is now a worldwide post that is known to the entire community of historians of chemistry.

Submitted by Gary Patterson

BULLETIN FOR THE HISTORY OF CHEMISTRY

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

Available online: http://acshist.scs.illinois.edu/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://acshist.scs.illinois.edu/info/bull-info.php

All matters relating to manuscripts, etc. should be sent to:

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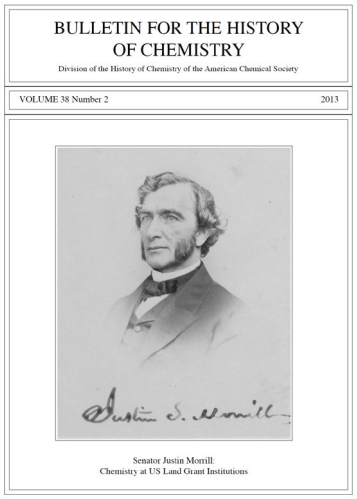

HIST Programming

Message from the HIST Program Chair

Greetings, dear friends and supporters of HIST! On behalf of the Division, I welcome you to the fall 2023 ACS National Meeting – the 266th for our Society. We will meet in the beautiful city of San Francisco where there will be abundant opportunities to learn from each other, exchange ideas, expand our professional network, or just catch up with old, as well as make some new friends.

We will offer a full 4-day program and I know you will enjoy and feel inspired by the fifty-odd talks and posters that will be presented at the meeting as part of our program.

Our activities will take off on Sunday morning with general papers that cover – as you have rightfully grown accustomed to expect – a variety of topics, ranging from the history of useful compounds to the contributions of scientists and educators that you may have barely heard of (or perhaps not).

The next day and a half, starting on Sunday afternoon, is dedicated to a collaborative symposium with the Energy and Fuels Division, which is also a Presidential event. It would be redundant to state how important fuels and energy are not only for our comfort and well-being, but also for our survival. Some of the discoveries will be presented and discussed that had a major impact on the development of new sources of energy, or the lives and careers of the scientists who made those discoveries. At noon on Monday, right after the morning session talks, as we do each fall, we will be available during the open-to-all HIST business meeting, to tell you about the business and financial side of the Division and answer any questions you may have. In the evening, visit our SciMix poster presenters as well as our table at Division Raw in the Convention Center. A number of HIST officers will participate in the event and will be thrilled to tell you about the exciting things we do. Perhaps you'd like to share your thoughts, give us some recommendations, or – even better! – get involved and work with us. Monday evening would be the perfect time to do that in a relaxed and friendly environment. You can also grab a copy of a delightful read – our peer-reviewed publication, the *Bulletin for the History of Chemistry*. Copies of the *Newsletter* will also be available with information on upcoming events, which are always subject to expansion, based on your suggestions. I say it again, all of us would be delighted to meet and converse with you.

We will continue on Tuesday (all day), when we will celebrate the contributions of our HIST Award winners – Marelene F. and Geoffrey W. Rayner-Canham, who have been prolific researchers and writers in the field of women in science. A number of inspiring and educational talks will be presented not only by the laureates, but also by their colleagues working on making this important subject more accessible to all. A poster session will take place at noon – do not miss it.

The following day, Wednesday, a full-day symposium on the very rich history of organometallic chemistry, organized by Christine Hahn, will take place. The lecturers will present many of the "faces and places," and methodologies and ideas relevant to the birth and evolution of the field.

Please stay with us till the end and you will leave San Francisco and the ACS meeting enriched in knowledge and positive impressions. All details about our program at the meeting are listed on the following pages.

Have a productive and pleasant meeting, and – above all – be well!

Nick Tsarevsky, *HIST Program Chair*

HIST SYMPOSIA, Fall 2023 ACS National Meeting (August 13-17, 2023)

Schedules and abstracts are listed at the end of this Newsletter.

HIST Award Banquet

As part of its activities at the Fall 2023 ACS National Meeting, the History of Chemistry Division is pleased to host the 2023 HIST Award Banquet honoring Drs. Marelene F. and Geoffrey W. Rayner-Canham and celebrating the accomplishments of the new HIST Fellows. The Banquet will be held at Sears Fine Food (https://www.searsfinefood.com, 439 Powell Street. San Francisco, CA 94102; phone: 415-986-0700) on Tuesday, August 15. It will start at 7:30 PM and will feature a starter (a choice of Chef's daily soup or blue cheese wedge salad), entrée (a choice of petite New York steak, grilled chicken breast, shrimp scampi, or vegetarian Louie), and dessert (white chocolate cheesecake). **Tickets are $60 and can be purchased from Vera Mainz, HIST Secretary-Treasurer**. The ticket covers the cost of the meal, tip, and tax. Ordinary beverages are included. Alcoholic beverages are available for additional cost from the cash bar. You can pay Vera via check or cash (exact amount preferred) at the banquet or when you see her during the meeting. If you do plan to attend, please **RSVP by August 12th (Saturday)** via email to Vera Mainz (mainz@illinois.edu).

UPCOMING MEETINGS AND HIST DEADLINES

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

2023 Southwest Regional Meeting (SWRM) of the ACS, Oklahoma City, OK, November 15-18, 2023

Lessons and Inspiration from the History of Chemistry (Invited and contributed) Nicolay V. Tsarevsky, Department of Chemistry, Southern Methodist University, Dallas, TX 75275, Phone: 214-768-3259, email: nvt@smu.edu; Christine Hahn, Department of Chemistry, Texas A&M University Kingsville, email: Christine.Hahn@tamuk.edu. The scheduled closing for abstract submission is August 14, 2023. For more information, visit . https://swrm.org/home/f/maps-is-open-for-abstract-submission.

Spring 2024 ACS National Meeting (New Orleans, LA, March 17-21, 2024)

The Birth of the 3rd Dimension in Chemistry (Invited and contributed) Arthur Greenberg, Department of Chemistry, University of New Hampshire, Durham, New Hampshire 03824, Phone: 603-862-1180, email: art.greenberg@unh.edu; David E. Lewis, Department of Chemistry and Biochemistry, UW-Eau Claire, Eau Claire, WI 54702, Phone: 715-836-4744, email: lewisd@uwec.edu

History of Catalysis (Invited and contributed) Christine Hahn, Department of Chemistry, Texas A&M University Kingsville, email: Christine.Hahn@tamuk.edu.

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

Fall 2024 ACS National Meeting (Denver, CO, August 18-22, 2024)

HIST Award Symposium (Invited) TBA

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

150th Anniversary of the Centennial of Chemistry Meeting (Invited and contributed) Roger Egolf, Department of Chemistry, Pennsylvania State University - Lehigh Valley, Center Valley, PA 18034, Phone: 610-285-5110, Email: rae4@psu.edu

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

Spring 2025 ACS National Meeting (San Diego, CA, March 23-27, 2025)

Chemical Technologists (Invited and contributed) Gary Patterson, Vancouver, WA 98661, Phone: 412-480-0656, email: gp9a@andrew.cmu.edu

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

Fall 2025 ACS National Meeting (Washington, DC, August 17-21, 2025)

HIST Award Symposium (Invited) TBA

Past ACS Presients: Frank Wigglesworth Clarke (1847-1931) (Invited and contributed) Gary Patterson, Vancouver, WA 98661, Phone: 412-480-0656, email: gp9a@andrew.cmu.edu; Carmen Giunta, PO Box 522, Manlius, NY 13104, Phone: 315-632-4992, email: giunta@lemoyne.edu.

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

Final Program

DIVISION OF THE HISTORY OF CHEMISTRY (HIST)

N. V. Tsarevsky, *Program Chair*

Sunday, August 13, 2023: Morning session

Location: Hilton Parc 55, Market Street

General Papers and Tutorial

N. V. Tsarevsky, M. C. Stefan, *Organizers*, *Presiding*

8:00 Discovery and uses of 'Coal Tar Colors' as commercial food dyes. **G.R. Wyllie**

8:30 True blue: A brief history of blue pigments and dyes through the ages. **E. Bosch**

9:00 Acetanilide and phenacetin: Early synthetic antipyretic/analgesic drugs in the dawn of drug regulation. **A. Haddy**

9:30 Improving the apparent stability of nitrocellulose at the turn of the twentieth century. **I. Rae**

10:00 Study on nanotechnology R&D strategies of great science and technology powers. **W. Bian**

10:30 Guillermo Patterson, father of chemistry in Panama. **G.G. Glugoski**, D. Rabinovich

11:00 Guyton de Morveau: The Visionary behind the Méthode de Nomenclature de Chimie. **L. Kambas**

11:30 Jasper Newton Roe (1864-1921): Chemist and bootlegger. **W.P. Palmer**

Sunday, August 13, 2023: Afternoon session

Location: Hilton Parc 55, Market Street

History of Energy and Fuels: Opportunities and Challenges

Cosponsored by ENFL and PRES
J. S. Jeffers, J. L. Liu, *Organizers*, *Presiding*

2:00 Introductory Remarks.

2:05 Formation and development of the division of petroleum chemistry: Tracing the evolution of the petroleum industry in America (1920–2012). **L. Houston**

2:35 Past and present transitions in transportation fuels. **A.L. Boehman**

3:05 Getting the lead out (after putting it in): Chemists' roles in the introduction and suppression of leaded gasoline. **C.J. Giunta**

3:35 Intermission.

3:50 Lithium-ion batteries from laboratory discovery to manufacturing and commercial success. **J. Liu**

4:20 Bringing fundamental principles of chemistry and engineering to the highly empirical field of fuels science. **R.L. McCormick**

4:50 Sergey Vasilievich Lebedev (1874-1934) and his work on hydrocarbon chemistry. **N.V. Tsarevsky**

5:20 Markovnikov in Moscow: The founding of Petrochemistry in Russia. **D.E. Lewis**

5:50 Concluding Remarks.

Sunday, August 13, 2023: Evening

Location: Hilton Parc 55, Mason

06:00-8:00 pm HIST Executive Committee meeting

Monday, August 14, 2023: Morning session

Location: Hilton Parc 55, Market Street

History of Energy and Fuels: Opportunities and Challenges

Cosponsored by ENFL and PRES
J. S. Jeffers, J. L. Liu, *Organizers*, *Presiding*

8:00 Introductory Remarks.

8:05 ACS Petroleum Research Fund: Past, present, and future. **N.J. Jensen**, **J. Schlatterer**

8:35 History of chemical looping process systems for energy and fuels production: Opportunities and challenges. **L. Fan**

9:05 From aqua vitae to E85: The history of ethanol as fuel. **S.C. Rasmussen**

9:35 We'd likely make the same mistakes again: What have we learned from Thomas Midgley? **M.E. Jones**

10:05 Intermission.

10:20 NYC and the establishment of chemicals manufacturing in the USA. **P. Spellane**

10:50 Balancing game of catalysis: A case history of iron catalysts and zeolite supports for Fischer-Tropsch synthesis of fuels and energy. A. Karre, **D. Dadyburjor**

11:20 Energy on postage stamps: From fossil fuels to renewables. **D. Rabinovich**

11:50 Concluding Remarks.

Monday, August 14, 2023: Noon

Location: Hilton Parc 55, Market Street

12:00-12:30 HIST Business Meeting – Open to all.

Monday, August 14, 2023: Afternoon session

Location: Hilton Parc 55, Market Street

History of Energy and Fuels: Opportunities and Challenges

Cosponsored by ENFL and PRES
J. S. Jeffers, J. L. Liu, *Organizers*, *Presiding*

2:00 Introductory Remarks.

2:05 Solar energy conversion and storage: A historical perspective from the Energy and Fuels (ENFL) Division. **R.T. Koodali**

2:35 Carl Schorlemmer's research and the "Rise and Development of Organic Chemistry". **C. Hahn**

3:05 Engineering solid sorbents for carbon capture. R. Liang, **H. Zhou**

3:30 Lone but not Alone: Modulating Lone-Pair-Derived States to Design Photocatalytic Architectures. **S. Banerjee**

3:55 Intermission.

4:05 Bridging the in-situ/operando soft x-ray spectroscopy and energy, catalysis and chemical science. **J. Guo**

4:30 Plastic Trash to Monomers and Intermediates – PTMI. **A.M. Gaffney**, G. Maffia

4:55 Progress in hydrogen production from photocatalysis to thermo-photo catalysis. **Y.H. Hu**

5:25 History of the fuel Chemistry Division and the transition with petroleum division to energy and fuels. **R.E. Winans**

5:55 Concluding Remarks.

Monday, August 14, 2023: Evening

Location: Moscone Center, Hall F, South Bldg.

HIST Sci-Mix Poster Session and Division Row

8:00 – 10:00 pm

Study on nanotechnology R&D strategies of great science and technology powers. **W. Bian**

Discovery and uses of 'Coal Tar Colors' as commercial food dyes. **G.R. Wyllie**

True blue: A brief history of blue pigments and dyes through the ages. **E. Bosch**

Acetanilide and phenacetin: Early synthetic antipyretic/analgesic drugs in the dawn of drug regulation. **A. Haddy**

Using demonstrations when discussing phlogiston theory. **W.C. Deese**

Historical highlights of Organometallic Chemistry as noted from the N and S banks of the Rio Grande. **K.H. Pannell**

Early history of zinc in organic synthesis. **D.E. Lewis**

Down the rabbit-hole: Research adventures in the history of women in chemistry. **G. Rayner Canham**, M. Rayner-Canham

… And yet more rarely recognized women chemists: An eclectic selection. **G. Rayner Canham**, M. Rayner-Canham

Balancing game of catalysis: A case history of iron catalysts and zeolite supports for Fischer-Tropsch synthesis of fuels and energy. A. Karre, **D. Dadyburjor**

ACS Petroleum Research Fund: Past, present, and future. **N.J. Jensen**, **J. Schlatterer**

Bridging the in-situ/operando soft x-ray spectroscopy and energy, catalysis and chemical science. **J. Guo**

Lithium-ion batteries from laboratory discovery to manufacturing and commercial success. **J. Liu**

Engineering solid sorbents for carbon capture. R. Liang, **H. Zhou**

Tuesday, August 15, 2023: Morning session

Location: Hilton Parc 55, Market Street

HIST Award

A. E. Johnson, *Organizer*
A. E. Johnson, D. Rabinovich, *Presiding*

8:00 Introductory Remarks.

8:15 Margaret Bryan: Newly discovered biographical information about the author of A Compendious System of Astronomy (1797). **G.S. Girolami**

8:45 New National Historic Chemical Landmark: Dr. Marie Maynard Daly, the first African-American woman to receive a Ph.D. in chemistry. **M. Orna**

9:15 Charlotte Roberts: Her 1896 stereochemistry textbook and some precursors. **A. Greenberg**

9:45 Intermission.

10:00 Women chemical engineers and engineering couples in Norway 1910-1990: Support, obstacles, strategies. **A. Lykknes**

10:30 Madame Lavoisier and Madame Pasteur: Couple, family, and domesticity in chemical sciences. **B. Van Tiggelen**

11:00 Teaching descriptive inorganic chemistry the Rayner-Canham way. **D. Rabinovich**

Tuesday, August 15, 2023: Noon

Location: Moscone Center, Hall A, South Bldg.

12:00-2:00 Poster Session

Poster 1139 Using demonstrations when discussing phlogiston theory. **W.C. Deese**

Tuesday, August 15, 2023: Afternoon session

Location: Hilton Parc 55, Market Street

HIST Award

A. E. Johnson, *Organizer*
A. E. Johnson, D. Rabinovich, *Presiding*

2:00 Pioneering women in science: A philatelic tribute. **D. Rabinovich**

2:30 Down the rabbit-hole: Research adventures in the history of women in chemistry. **G. Rayner Canham**, M. Rayner-Canham

3:30 Intermission.

3:45 … And yet more rarely recognized women chemists: An eclectic selection. **G. Rayner Canham**, M. Rayner-Canham

4:15 From women in chemistry to EDI: Making Canadian chemistry more inclusive. **N. Etkin**

4:45 Concluding Remarks.

Wednesday, August 16, 2023: Morning session

Location: Hilton Parc 55, Market Street

History of Organometallic Chemistry

C. Hahn, *Organizer, Presiding*

8:00 Introductory Remarks.

8:05 Application of physical organic methods to the investigation of organometallic reaction mechanisms. **R.G. Bergman**

8:45 Historical antecedents for organometallic chemistry developed in the Gladysz group: The mentors and prior investigators who made it possible. **J.A. Gladysz**

9:25 Historical highlights of Organometallic Chemistry as noted from the N and S banks of the Rio Grande. **K.H. Pannell**

9:55 Intermission.

10:10 Molecules that turn themselves inside-out: The historical roots of homeomorphic isomerization. **J.A. Gladysz**

10:40 Franz Hein and the fascinating story of his “polyphenylchromium compounds”. **C. Hahn**

Wednesday, August 16, 2023: Afternoon session

Location: Hilton Parc 55, Market Street

History of Organometallic Chemistry

C. Hahn, *Organizer, Presiding*

2:00 Edward Frankland and the birth of organometallics. **S.C. Rasmussen**

2:30 Early history of zinc in organic synthesis. **D.E. Lewis**

3:00 Carl Jacob Loewig (1803-1890): A pioneer of organometallic chemistry. **N.V. Tsarevsky**

3:30 Intermission.

3:45 Victor Grignard's contribution to organic chemistry. **M.C. Stefan**, M.C. Biewer

4:15 Eclectic philatelic history of organometallic chemistry. **D. Rabinovich**

ABSTRACTS

HIST 3925354

Discovery and uses of 'Coal Tar Colors' as commercial food dyes

Graeme R. Wyllie, wyllie@cord.edu. Chemistry, Concordia College Moorhead, Moorhead, Minnesota, United States

While the earliest reports of aniline are based on samples isolated from indigo dye, the subsequent successful isolation of this material from coal tar in the 1830s led to production of the first synthetic aniline dyes. Further advances in 1840s then allowed the production of aniline from nitrobenzene, greatly expanding its availability and resulting in the development of a veritable rainbow of colored synthetic dyes, including most famously Mauve, the purple dye successfully prepared by William Perkin in 1856. While many of the dyes would be used in textile applications, several found their way into use as food and drink colorings with several renamed and still used to this day. These days, there are only seven remaining of these aniline derivatives which are described by the Food and Drug Administration in the US as certifiable color additives, in common usage. This presentation will tell the story of these and related food dyes from their initial synthesis and early analysis, through uses both as culinary dyes and in the sciences, to their naming and regulation in the early 20th century.

HIST 3927122

True blue: A brief history of blue pigments and dyes through the ages

Eric Bosch, ericbosch@missouristate.edu. Chemistry and Biochemistry, Missouri State University College of Natural and Applied Sciences, Springfield, Missouri, United States

This talk will provide an overview of the chemistry and history of natural and synthetic sources of inorganic and organic blue pigments through the ages. The review will begin with the use of ground Lapis Lazuli mineral as the ultramarine pigment. Ancient synthetic inorganic blues including Egyptian blue and Han blue will be presented followed by the early modern synthetic inorganic pigments Prussian blue from the 1700's and cobalt blue and other cobalt containing blues in the 1800's. The overview of inorganic pigments will end with the discovery of YInMn in 2009. Early organic sources of blue pigments and dyes to be described include the plant extracts woad and indigo. The variety of modern synthetic organic blues to be presented include the triarylcarbonium pigments, indanthrone blue and copper phthallocyanines.

HIST 3927284

Acetanilide and phenacetin: Early synthetic antipyretic/analgesic drugs in the dawn of drug regulation

Alice Haddy, aehaddy@uncg.edu. Chemistry and Biochemistry, UNC Greensboro, Greensboro, North Carolina, United States

Acetanilide and phenacetin were early synthetic aniline-derivatives that came into use as antipyretic and analgesic drugs in the late 19th century. They were among the earliest antipyretics known and their analgesic properties made them popular alternatives to opium and morphine. They were widely used in headache and cold remedies for decades until they were removed from the market in the 1980s. Acetanilide (*N*-phenylacetamide), a product of the coal tar chemical industry, was discovered by accident to have antipyretic properties in 1886 and was quickly marketed as a drug by Kalle and Company. While relieving fever and headache, it had the unfortunate side effect of causing cyanosis due to reduced capacity of hemoglobin to bind oxygen. Phenacetin (*N*-(4-ethoxyphenyl)acetamide or acetphenetidin) was developed and introduced to the market in 1887 by Bayer Company. It was a safer alternative to acetanilide, but it was eventually associated with renal disease. Prior to passage of the Pure Food and Drug Act in 1906, there was no federal regulation of drug contents, labeling, or safety in the US. The Act was only a first step toward the regulations we know today. It prohibited misbranding or mislabeling of food and medicines and required that medicines containing any of ten specified drugs show its amount on the label; these ten drugs were considered potentially harmful and included acetanilide and phenacetin. In the years leading up to and just following the passage of the Act, concerned agencies and associations sought to understand the level of use and effects of the aniline-based analgesics. A leader in this effort was Lyman F. Kebler, Chief of the Division of Drugs within the Bureau of Chemistry, which was the branch of the Department of Agriculture that oversaw food and drug safety. With degrees in pharmaceutical chemistry and medicine, Kebler had high standards for accuracy in analytical measurements. Kebler's Division oversaw the earliest drug regulation efforts and undertook relevant studies involving in-house analyses, surveys, and literature studies of pharmaceutical information. These efforts were among the first to document the sources and effects of acetanilide and phenacetin consumed by the American public and provide an early road map to understanding their use.

HIST 3917578

Improving the apparent stability of nitrocellulose at the turn of the twentieth century

Ian Rae, iandrae@bigpond.com. Chemistry, University of Melbourne, Melbourne, Victoria, Australia

Nitrocellulose, first prepared in the 1840s and widely used since then as a propellant—hence the alternative name, 'guncotton'—is a notoriously unstable material. A number of tests were devised for assessing the stability of stored nitrocellulose, the most common of which was devised by Frederick Abel, and consisted of warming it and noting the time for brown fumes

of nitrogen dioxide to appear and cause colour to appear in a starch-iodide test paper. The apparent stability of some samples was traced to the presence in them of small quantities of mercuric chloride that enabled them to pass the Abel test when perhaps they should not have. The question of why the mercury was present remained unresolved: did it result from contamination during the preparation of nitrocellulose, or had it been added to prevent biological spoilage or deliberately to foil the Abel test? The explanation for its effectiveness—that mercury reacted with iodine and prevented formation of the starch-iodide complex—stretches chemical credulity but no better explanation was ever advanced. Test papers impregnated with methyl violet or diphenylamine/sulphuric acid were available for use in heat tests, and were not impaired by the presence of mercury, but the approach of British (and most other) ordnance laboratories was stick with the Abel test and destroy any material found to contain trace mercury, for which analytical tests based on conversion to metallic mercury and assessment by observation, mass measurement or visible spectroscopy were developed.

HIST 3919886

Study on nanotechnology R&D strategies of great science and technology powers

Wenyue Bian, bianwenyue@casisd.cn. Institutes of Science and Development, Chinese Academy of Sciences Beijing Branch, Beijing, China

By analyzing nearly 150 strategy and planning documents issued by great science and technology powers during 2000-2022, the paper finds that the great powers have taken a series of effectual measures to develop nanotechnology in the early two decades of the 21st century, and wraps up the measures in ten aspects as follows. (1) Identifying nanotechnology as a key technology for the economy and national competition. (2) Establishing multi-department/multidisciplinary agencies to meet the multidisciplinary nature of nanotechnology. (3) Developing strategic plans to guide the development of nanotechnology, and implementing major programs with huge investment. (4) Establishing multidisciplinary research centers based upon organizations (such as universities, institutions, and firms) with strength. (5) Developing and maintaining physical and cyber nanotechnology research infrastructures. (6) Promoting convergence of nanotechnology, information technology, biotechnology, and cognition science. (7) Establishing facilities to accelerate the commercialization of nanotechnology. (8) Paying particular attention to the potential environmental and health implications of nanotechnology. (9) Developing a skilled workforce and attracting global talents. (10) Engaging in international collaborations. In the past two years (2021-2022), the great powers have continued paying great attention to nanotechnology with emphasis on issues such as the application of nanotechnology, the transition to the data-intensive R&D paradigm, and talents.

HIST 3920729

Guillermo Patterson, father of chemistry in Panama

Greta G. Glugoski[2], gggmay23@comcast.net, Daniel Rabinovich[1]. (1) Dept. of Nanoscience, Joint School of Nanoscience and Nanoengineering, Greensboro, North Carolina, United States(2) Dept. of Science, Regis Jesuit High School, Aurora, Colorado, United States

Guillermo Patterson (1884-1964), the first Panamanian to become a member of ACS and the first one to obtain a Ph.D. degree from a university in the United States (Notre Dame, 1912), is considered the father of chemistry in Panama. Upon returning to Panama in 1912, he embarked in a distinguished career in chemistry and politics, which included serving as Mayor of Panama City (1913) and a five-year term as member of the National Assembly in Panama (1914-1918). Surprisingly, there is very little biographical information available about Patterson, even in Spanish. This presentation will describe Patterson's work as a chemist and his various contributions to the world of politics in Panama.

HIST 3895411

Guyton de Morveau: The Visionary behind the *Méthode de Nomenclature de Chimie*

Liz Kambas, ekambas@iu.edu. History of Science, Indiana University, Bloomington, Indiana, United States

Louis-Bernard Guyton de Morveau (1737-1816) is an altogether forgotten figure. A reformer at heart, he spurred change in educational curricula, legal codes, the public's engagement with science, and most importantly: chemical nomenclature. His later connection to the chemist Antoine-Laurent Lavoisier coupled with his own reformist tendencies evidenced itself most prominently in the *Méthode de Nomenclature de Chimie* (1787), however, his vision of a revised nomenclature for chemistry had begun years prior. Influenced by the efforts of Tobern Bergman and P.J. Macquer to redress the dilapidated chemical nomenclature, de Morveau published his first attempt at reformulation of the nomenclature in 1782 with his "Mémoire sur les denominations chymiques." Similarly, his article on "Acide" in the *Encyclopedie Methodique, Chymie, Pharmacie et Metallurgie*, convinced other chemists to consider acids and salts within a gently reformed nomenclature. Chemistry's nomenclature

was seriously advanced by de Morveau, but his collaboration with Lavoisier and others on the *Méthode de Nomenclature de Chimie* ended up eclipsing his own longstanding contributions to the project; the present paper aims to vindicate this forgotten thinker.

HIST 3919864

Jasper Newton Roe (1864-1921): Chemist and bootlegger

William P. Palmer, bill_palmer15@hotmail.com. STEM, Curtin University, Perth, Western Australia, Australia

Jasper Newton Roe was the author of a chemistry laboratory manual, four copies of which are included in the Bill Palmer Manual collection. His status as a chemist is currently scarcely visible but his life story is unusual. Jasper Newton Roe was born on 17th July 1864 in Markle, Huntington County Indiana. His father was Jeremiah Michael Roe and his mother was Mary Ann Elizabeth (Gamand) Roe; he was one of ten children. He was successful at school where he attended the district schools in Union Township, graduating from the Ossian grade and high schools. He then attended Valparaiso University obtaining an AM degree and finally progressing to a D.Sc. He joined the staff of the chemistry department of Valparaiso University. He wrote a chemistry laboratory manual entitled *Practical Chemistry*. He was in charge of the Departments of Pharmacy and Chemistry at Valparaiso from 1889 but thereafter spent his time as Secretary and Treasurer of the Medical and Dental Departments in Chicago. In 1906, he brought about the affiliation of this college with Valparaiso University. He was very close to Henry B. Brown, President of Valparaiso University who was the majority shareholder of Valparaiso University. When Brown became ill, he left the administration of the university in Roe's hands and after Brown's death, his widow accused Roe of stealing Brown's shares. Roe purchased a major Chicago hotel; he was convicted of bootlegging sentenced to eighteen month's gaol but before starting his sentence, he died of stomach cancer. Some newspapers stated that he had faked his own death and was living in South America, but there is no strong evidence for his resurrection. The chemistry laboratory manual that he wrote remains as his memorial.

HIST 3927392

Formation and development of the division of petroleum chemistry: Tracing the evolution of the petroleum industry in America (1920–2012)

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World War I brought changes to America when chemistry plants moved from Europe to the United States and petroleum use shifted from kerosene for lighting to gasoline for automobiles. The American Chemical Society (ACS), which had just celebrated it 40th anniversary in 1916, had catalogued petroleum research under the Division of Industrial and Engineering Chemistry. However, petroleum chemists wanted a separate home in the

Society. This presentation will discuss the formation and development of the Division of Petroleum Chemistry (PETR) as well as the petroleum industry over nearly a century (1920-2012).

HIST 3916168

Past and present transitions in transportation fuels

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With the pressure to dramatically reduce the greenhouse gas emissions from the transportation sector, it is instructive to consider previous transitions that have occurred in energy consumption. Prior to the industrial revolution and the advent of the age of fossil fuels, transportation relied on renewable resources such as wind power and biomass (animal feed). But even during the industrial age, society has moved between fuels, including for transportation. Before petroleum came to dominate the energy supply for transportation, much of the transportation system of that time came from coal. Society has undergone dramatic transitions in the past, and the only difference with our current situation is the scale of that transition because of the size of the population and how much society relies on the transportation of materials, goods and people to function. In this presentation, we will explore the present transition in fueling of the transportation sector, and how the past can inform us about the challenges and opportunities as we make this transition.

HIST 3921236

Getting the lead out (after putting it in): Chemists' roles in the introduction and suppression of leaded gasoline

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Leaded gasoline was first sold in 1923; in 2021, efforts to ban its widespread use were practically complete all over the world. Chemical scientists such as Thomas Midgley Jr., Alice Hamilton, and Clair Patterson played important roles in both its introduction and in recognizing its hazards. Midgley invented leaded gasoline, the result of a long search for a fuel that burned with less engine "knock" than gasoline available at the time. Leaded gasoline undoubtedly caused serious harm to human health and to the environment. Its introduction was controversial, and it was opposed by public and occupational health experts including Alice Hamilton, an authority in lead poisoning. Initial regulatory scrutiny focused on acute toxicity, though, and leaded gasoline was allowed onto the US market. Decades later, Patterson, a geochemist, documented the widespread distribution of lead in the environment and in humans at levels well above natural ones. The subsequent decline in the use of leaded fuels

was due both to regulation aimed at limiting their harm and to the development of unleaded fuels that were able to reduce knock without leaded additives.

HIST 3919336

Lithium-ion batteries from laboratory discovery to manufacturing and commercial success

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The development, manufacturing and commercialization of lithium-ion batteries took several decades. The success is a result of the intense efforts of many generations of scientists and engineers from many countries and their productive collaborations. It requires long time commitment to fundamental research and fundamental discoveries. Transformation from laboratories to successful products also requires intense efforts for the community and industry to develop and build engineering and manufacturing knowledge and skills for scaling up, quality and cost controls. Manufacturing is capital intense. The industry needs to commit to long time investment with visionary leadership that is not driven by short term profits. The manufacturer should be integrated with the product to meet the market demand. Finally, it is important to develop an integrated ecosystem from upstream, materials supply, from discovery to manufacturing, and to downstream, markets applications.

HIST 3925551

Bringing fundamental principles of chemistry and engineering to the highly empirical field of fuels science

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Internal combustion engines and the fuels that they consume developed in parallel beginning in the late 19th and early 20th centuries. Over this very long period, there has been a slow improvement in understanding of the chemistry and chemical engineering of petroleum conversion processes, and a slow improvement in understanding of the physics of internal combustion engines, with a focus on fuel properties rather than the underlying chemistry. While the chemistry of how fuels work in engines was not completely ignored, it was not until the last 30 years or so that fundamental principles of chemistry began to be applied to engine combustion. This presentation will explore several examples of this development, including the chemistry of octane sensitivity (why we have two octane numbers), soot formation from spark ignition engines, a conceptual model of diesel spray combustion, the application of ignition delay sensitivity to air/fuel ratio to controlling ignition in homogeneous charge compression ignition engines, and how saturated monoglyceride polymorphism explains field

observations of field observations of biodiesel low-temperature operability problems. Future opportunities will also be described. Hopefully I will have enough time to cover it all.

HIST 3922694

Sergey Vasilievich Lebedev (1874-1934) and his work on hydrocarbon chemistry

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Sergey Vasilievich Lebedev, the Russian chemist best known for the discovery of butadiene rubber and his contributions to polymer chemistry, as well as for the development of commercially viable synthesis of butadiene from ethanol, was born and grew up in Poland. In 1895, he finished high school in Warsaw and entered St. Petersburg University where, in 1897, he started working in the laboratory of Alexey Yevgrafovich Favorsky. He graduated in 1899 with work on trichloro-o-methoxyphenylcarbinol. After his military service and a short visit to the Sorbonne, where he concentrated on the polymorphism of sulfur, Lebedev returned to St. Petersburg in 1906. Following Favorsky's advice, he began studying the polymerization of monovinyl compounds (vinyl bromide and the esters of acrylic acid) and before long his attention shifted to divinyl monomers, particularly butadiene. This work marked the beginning of a very productive period, during which much-needed synthetic rubber was discovered and eventually commercialized. In 1912, Lebedev was an associate at the "Neftegaz" oil factory, and he conducted work on the preparation of toluene and the pyrolysis of oil. In later years, especially during the period 1921-34, Lebedev studied the catalytic hydrogenation of unsaturated hydrocarbons. For his numerous contributions to fundamental and applied chemistry, and the development of industrially important processes, he was elected (1928) corresponding member of the USSR Academy of Sciences and later (1932) he became an Academician. In this talk, details will be provided on Lebedev's most significant and impactful discoveries.

HIST 3900461

Markovnikov in Moscow: The founding of Petrochemistry in Russia

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Following his appointment to Moscow Uninversity in 1875, Markovnikov's research focus changed from the "pure" research topic of the Structural Theory of Organic Chemistry to the "applied" topic of the composition of the Baku and Caucasus oils.This change, which was deplored by many of his contemporaries, led to the development of petrochemistry in Russia. The early days of petrochemistry in Russia provide a picture of the application of Butlerov's version of Structural Theory under the guidance of one of the theory's most ardent suppoerters. This talk will focus on Markovnikov and Kizhner, in particular, along with

Zelinskii, who was Markovnikov's *bête noir* and helped orchestrate his ouster from the Chair at Moscow. Markovnikov's *Neft i neftyanya promishlennost [Oil and the Oil Industry]* was a monumental work on the chemistry of cycloalkanes. His student, Kizhner, first worked on the identification of the "hexahydrobenzene" obtained by Berthelot reduction of benzene with concentrated HI in a sealed tube above 150 °C, which was not cyclohexane as had been predicted on he basis of Kekulé's structure.

Vladimir Vasil'evich Markovnikov (1837-1904)

Nikolai Matveevich Kizhner (1867-1935)

HIST 3930836

ACS Petroleum Research Fund: Past, present, and future

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The ACS Petroleum Research Fund provides seed money research grants for transformative research related to petroleum and petroleum derived materials. In its sixty-eight years it has also been a key component in the initial phases of many successful academic careers. The presentation will include: (1) a brief history of PRF, its mandate and legal constraints, (2) examples of research supported over the years and impact on academic careers in chemistry and geology, and (3) how PRF’s mandate and requirements mesh with topics of current interest and looks to the future.

HIST 3923523

History of chemical looping process systems for energy and fuels production: Opportunities and challenges

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The science and engineering of metal derivative-based chemical looping technologies are characterized by the interplay among a broad spectrum of subjects concerning metal derivative physics, chemistry and reaction engineering, and particle science and technology. Specifically, these technologies encompass three main components - Materials: metal derivative material synthesis, reactivity, reaction-regeneration mechanism, recyclability, and physical strength; Reactors: flow pattern and stability, gas-solid contact mechanics, scaling rule; and Systems: process integration, intensification, and optimization. Such interplay is of multiscale and is so complex that it has been over 100 years that the chemical looping technology has not been able to be successfully commercially deployed. The major advances have changed the outlook of this technology of which the commercialization is now realistically realizable. Using metal oxides as an example, these advances include the successful development of chemically, physically robust metal oxide oxygen carriers that are cost-effective and sustainable to long-term redox reactor environment. They also include the successful employment of CO_2 and H_2O as partial substitute of carbonaceous feedstock for combustion, gasification and reforming applications thereby yielding CO_2 negative chemical looping processes that are applicable also to dry or mixed reforming without concern of carbon deposition as commonly experienced in catalytic systems. These advances coupled with a novel reactor design and operation can give rise to a significant reduction in the capex over that with conventional process technology approaches in the production of electricity, hydrogen, syngas, liquid fuels, and chemicals. The general reaction schemes of chemical looping can also have varied technological implication, featuring it as the platform technology. The SULGEN Process recently invented at the OSU can be in one step capturing H_2S with another step separating it to H_2 and S. It can potentially be applied to petroleum fuel refining, natural gas sweetening, and other fossil fuel gasification and reforming processes, in place of the Claus process. This presentation will first describe the historical perspectives and lessons learned and then discuss the activities of Babcock and Wilcox Company, the OSU chemical looping technology licensee, in constructing the historically first commercial plant for the H_2 production from a variety of feedstocks.

HIST 3900437

From aqua vitae to E85: The history of ethanol as fuel

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Ethyl alcohol, or ethanol, is one of the most ubiquitous chemical compounds in the history of the chemical sciences. The generation of alcohol via fermentation is also one of the oldest

forms of chemical technology, with the production of fermented beverages predating the smelting of metals. By the 12th century, the ability to isolate alcohol from wine had moved this chemical species from a simple component of alcoholic beverages to both a new medicine and a powerful new solvent. The use of alcohol as a fuel, however, did not occur until significantly later periods, the history of which is generally presented as a separate narrative from its initial applications as intoxicating beverages, medicines, or chemical reagents. The current report aims to more firmly connect these two disparate historical accounts, presenting an overview of the history of ethanol from its initial isolation in the 12th century, its initial applications in heat and lighting, up through its current application as a fuel additive for most automotive vehicles in the United States.

HIST 3921690

We'd likely make the same mistakes again: What have we learned from Thomas Midgley?

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Trying to make one thing better frequently makes another worse. Tradeoffs now dot the sustainability landscape. Thomas Midgley is, in the minds of many, the poster-child for unanticipated consequences. His history serves as a launching point for a discussion of toxic releases caused by chemistry designed to be more sustainable. Though sustainable wasn't the descriptor used at the time, Midgley's efforts were centered on more efficient, safer options, just as many are pursuing today. The thought experiment of whether a toxic material, like lead, could be used today to meet environmental goals will be considered. Some lessons have been learned though perhaps not enough to avoid unanticipated consequences.

HIST 3927999

NYC and the establishment of chemicals manufacturing in the USA

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Chemicals manufacturing in the United States began with the production of sulfuric acid in Philadelphia, not long after the conclusion of the Revolutionary War. In the early decades of the 19th century, the production of reagent chemicals in New York City began to outpace that of Philadelphia. The New York Chemical Manufacturing Company was chartered in 1823 but survived only until the terminus of its original charter. A persistent chemicals-manufacturing industry followed Peter Cooper's establishing a glue factory in Bushwick in 1830. The production of fuels and fertilizer on an industrial scale was enabled by Martin Kalbfleisch's modern production of sulfuric acid. A reliable supply of sulfuric acid enabled the production of superphosphate, phosphate extracted from bones of horses. Sulfuric acid supply also enabled the industry that refined kerosene from oil-rich coals. As petroleum replaced coal as

source of kerosene, Kalbfleisch's sulfuric acid production supported a larger-volume kerosene industry. Petroleum refining required still more concentrated sulfuric acid. Production of sulfuric acid from sulfur-rich chalcopyrite mineral sources led the Nichols Chemical Company to pursue recovery and refining of copper metal. These interrelated lines of production (sulfuric acid, high-purity copper, refined petroleum) had in common their place of production: along the shores of New York City's inner harbor. New York City's success as a venue for production of chemicals, refined petroleum, and high-purity copper was assured by the City's access to world markets, and New York City's success as a center of commerce and trade is due in large part to the City's vigorous chemicals- and fuels-manufacturing economy.

HIST 3930054

Balancing game of catalysis: A case history of iron catalysts and zeolite supports for Fischer-Tropsch synthesis of fuels and energy

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Cost (with sustainability rolled in) is the determinant in the balance that comprises all engineering design. In catalytic processing, the elements of cost/sustainability in the balance are the catalyst type, whether (or which) supports are used, processing conditions (reactor type, pressure, temperature, composition -- including inerts, product slate/selectivity, and product separation) and others. In the particular case of Fischer-Tropsch synthesis, which converts carbon monoxide and hydrogen to liquid fuels, using lowly iron as a catalyst can be balanced against using cobalt, and iron has much to recommend itself over its fancier cousin. Similarly, zeolite catalysts have been a game changer for cracking processes, which convert heavy hydrocarbons to lighter ones, as well as other reactions. Here, we briefly review the history of balancing iron with cobalt, and iron with or without zeolite supports, when used as catalysts in Fischer-Tropsch synthesis. Over the years, the general conclusion is that iron has been shown to improve selectivity with respect to cobalt, and the addition of zeolite as a support to iron has been shown to improve olefin, aromatic and branched products, and the conversion of oxygenates to hydrocarbons.

HIST 3900724

Energy on postage stamps: From fossil fuels to renewables

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This presentation will use postage stamps to illustrate the evolution of energy resources, from the widespread use of coal before and during the Industrial Revolution and the development

of the oil and natural gas industries in the U.S. and elsewhere to the emergence of renewable sources of energy. A surprisingly large number of stamps have been issued in different countries to underscore the increasing importance of generating electricity and heat from natural processes that are constantly replenished, as is the case of solar, wind, geothermal, and biomass resources.

HIST 3914877

Solar energy conversion and storage: A historical perspective from the Energy and Fuels (ENFL) Division

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The Energy and Fuels (ENFL) Division of the American Chemical Society was formed by the merger of the erstwhile Fuel (FUEL) and Petroleum (PETR). The first FUEL Symposia as a new Division was conducted in Philadelphia at the Fall 2012 ACS National Meeting. The FUEL and now ENFL division have long held symposia in the broad area of solar energy storage and conversion given the scope and mission of these divisions. These solar energy symposia have garnered significant attention with contributions from leading scientists from all over the world. The interests stem from recent advances in this discipline that provide immense promise for its application to generate electricity or fuel (in the form of hydrogen as an energy carrier) to meet the increasing global demand. The invited talk will highlight selected key recent accomplishments in the area of solar energy with focus on contributions made by speakers at solar energy symposia organized by ENFL in recent years to provide a rich and historical perspective of this burgeoning field.

HIST 3922580

Carl Schorlemmer's research and the "Rise and Development of Organic Chemistry"

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Triggered in 1861 by an analysis of British coal and American petroleum samples Carl Schorlemmer established his research in the field of simple hydrocarbons. His studied the whole series of alkanes up to octane and isolated for the first time n-pentane, n-heptane, and diisopropyl. By halogenation of hydrocarbons and conversion in alcohols he discovered new isomeric relations and shed light into their constitution. Schorlemmer became specialized in the classification of simple hydrocarbons under a uniform theoretical point of view. In this regard he is considered as the founder of the petrochemistry. Carl Schorlemmer was highly interested in the historical approach of chemistry and in the clarification on ongoing controversial debates during the 19th century on radical theory, substitution theory and isomerism. This culminated in his famous book the "Rise and Development of Organic Chemistry", in which he describes the development of new concepts and theories in organic chemistry. He emphasized the important role of theoretical imagination and new hypotheses on solving molecular structures. Schorlemmer's contributed to the demystification of organic chemistry by demonstrating that man can synthesize natural occurring organic compounds and that the same chemical laws apply to both inorganic and organic chemistry.

HIST 3927936

Engineering solid sorbents for carbon capture

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The urgent need to address energy sustainability, climate change, and environmental protection has driven the development of various techniques for capturing and separating CO_2. Among these, porous solid sorbents have emerged as a promising method for CO_2 capture, and our research efforts have focused on investigating porous materials such as metal-organic frameworks (MOFs), mixed matrix membranes (MMMs), porous polymer networks (PPNs), and hydrogen-bonded organic frameworks (HOFs) for this purpose. Our main objective is to develop high-performance sorbents that are both stable and cost-effective. To achieve this, we have employed various strategies to construct porous MOF architectures, including integrating single-molecule traps (SMT) into MOFs and decorating the framework backbone with nitrogen-donating functional groups. Our synthesized water-stable MOF, PCN-200, allows for low-energy selective CO_2 capture through stimuli-responsive adsorption and has a high selectivity of 205 for binary CO_2/N_2 mixtures (15:85). We have also developed free-standing, thickness-controllable, and flexible MMMs by mixing polymer matrix and metal-organic polyhedra (MOP) solutions, demonstrating an ideal CO_2/N_2 selectivity of 113. Additionally, we have investigated PPN materials with amorphous but porous structures, which are highly practical due to their low cost. To enhance their

performance, we have incorporated tailored functionalities through covalently/noncovalently decorating with alkylamine/sulfonate functional groups, achieving high CO_2 loading efficiency (18.75 ± 2.24 wt%) and low regenerative energy (82.8 kJ/mol CO_2) for PPN-151-DETA. This material can be synthesized in kilogram scale with a cost as low as $40/ton. Our recent focus has been on developing robust HOFs with permanent porosity for CO_2 capture and separation. We have maximized the formation of hydrogen bonding to construct ultra-stable 3D HOFs with remarkable CO_2 uptake and excellent CO_2/N_2 selectivity. In-situ IR experiments and calculation studies have revealed that the preferential adsorption sites for CO_2 are near the phenyl rings rather than DAT moieties. Overall, our research efforts on developing various techniques for CO_2 capture and separation using porous materials have significant potential to address energy sustainability, climate change, and environmental protection.

HIST 3913865

Lone but not Alone: Modulating Lone-Pair-Derived States to Design Photocatalytic Architectures

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Harnessing solar irradiance, through photocatalytic generation of solar fuels has emerged as an urgent imperative for the energy transition. Functional photocatalysts must be capable of efficiently absorbing sunlight, effectively separating electron—hole pairs, and ensuring they are delivered at appropriate potentials to catalytic sites to mediate redox reactions. Such photocatalytic architectures must further direct redox events down specific reaction trajectories to yield desired products, and ensure the transport of reactants between catalytic sites; all with high efficiency and minimal degradation. I will describe a palette of heterostructures designed to promote robust and efficient direct solar-driven water splitting. The heterostructures comprise $M_xV_2O_5$ or $M_xM'_yV_2O_5$ (where M is a p-block cation, M′ is an s-, p-, or d- block cation) and V_2O_5 represents one of multiple polymorphs of this composition interfaced with semiconductor quantum dots (QDs). The stereochemically active $5/6s^2$ electron lone pairs of p-block cations in $M_xV_2O_5$ give rise to filled mid-gap electronic states that reside above the O 2p-derived valence band. Within heterostructures, the photoexcitation of QDs results in the transfer of holes to the mid-gap states of $M_xV_2O_5$ or $M_xM'_yV_2O_5$ on <1 ps time scales. Ultrafast charge separation minimizes the photoanodic corrosion of QDs, which has historically been a major impediment to their use in photocatalysis, and enables charge transport and the subsequent redox reactions underpinning photocatalysis to compete with electron-hole recombination. Design principles for understanding the nature of lone pair states will be discussed. The dimensions, composition, and doping of QDs along with interfacial structure afford additional levers for heterostructure integration, enabling tuning of thermodynamic energy offsets and charge transfer dynamics, which have been systematically modulated across several generations of heterostructures to improve photocatalytic performance.

HIST 3914151

Bridging the in-situ/operando soft x-ray spectroscopy and energy, catalysis and chemical science

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The energy materials and devices have been largely limited in a framework of thermodynamic and kinetic concepts or atomic and nanoscale. Synchrotron based x-ray spectroscopic techniques offers unique characterization in many important energy materials of energy conversion, energy storage and catalysis in regards to the functionality, complexity of material architecture, chemistry and interactions among constituents within. However, it is challenging to reveal the real mechanism of the chemical processes. In the operando soft x-ray spectroscopy characterization of interfacial phenomena in energy materials and devices, it has been found that the microstructure and composition of materials as well as the microstructure evolution process have a great influence on performances in a variety of fields, e.g., energy conversion and energy storage materials, chemical and catalytic processes. This presentation will show how to best use the in-situ/operando soft x-ray spectroscopy characterization techniques in the last two decades, including soft x-ray absorption spectroscopy (XAS) and resonant inelastic soft x-ray scattering (RIXS) to investigate the real electrochemical mechanism during the operation. The experimental results show how in-situ/operando soft x-ray spectra characterization techniques uncover the phase conversion, chemical and environmental change of elements and other very important information of solid/gas and solid/liquid interfaces in real time, thus further enhance the understanding of real reaction mechanism.

HIST 3897369

Plastic Trash to Monomers and Intermediates – PTMI

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This technology addresses the issue of waste plastics in landfills, a hybrid approach is proposed. It would use low temperature plasma pretreatment followed by catalytic cracking to augment the conversion of waste polyolefins into monomers, intermediates, new polymers and value-added chemicals. Lightweight packaging (LWP) comprises about 50% of total plastics consumption and consists mainly of single and multilayer films and containers. LWP is heterogenous, contaminated and is difficult to recycle. Mechanical recycling is currently the only commercial approach to recycling but is inadequate to address the growing volume of packaging plastics and degrades or downcycles both polyethylene (PE) and polypropylene (PP). In contrast, feedstock recycling converts polymers to monomer feedstock that can be used to make new products that have virgin-like performance in high volume single use packaging applications, thereby creating new value chains for what is currently a waste stream. Current high TRL feedstock recycling technologies like pyrolysis and gasification are

highly energy intensive, require multiple steps (plastics-syngas-methanol-olefins) and have low selectivity to polyolefin building blocks (ethylene, propylene). Alternatively, plastics upcycling aims at selectively deconstructing polymer in a one-step process directly into monomers and high value chemicals (HVC). Consequently, it is proposed to use a hybrid approach of preconditioning with a low temperature plasma followed by catalytic cracking for conversion of waste polyolefins into monomers, intermediates, new polymers and value-added chemicals. This offers improvement in carbon utilization, cumulative energy demand and selectivity to recycled high value products over current benchmark feedstock recycling processes like gasification and pyrolysis. It is suggested to use LTP treatment as a tunable polyolefin functionalization step to increase selectivity of subsequent catalytic deconstruction and reconstruction. The target waste stream is post-industrial and post-consumer packaging waste, mainly LDPE, LLDPE, and PP films.

HIST 3922081

Progress in hydrogen production from photocatalysis to thermo-photo catalysis

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In 1970s, Fujishima and Honda successfully achieved photoelectrocatalytic water splitting into H_2 in a cell consisting of a TiO_2 photoanode and a Pt counter electrode. This has inspired worldwide research interests in photocatalysis. However, photocatalysis is far from achieving 10% energy efficiency for practical applications due to its poor utilization of visible light. In the past 50 years, the global efforts have been focused on the development of efficient semiconductor catalysts to meet two requirements: (1) visible light can be absorbed and (b) the band structure matches the redox potentials of the reactants to obtain sufficient driving force for reduction and oxidation reactions. However, these two requirements are conflicting, namely, the visible light absorption requires a small band gap between the valence band (VB) and conduction band (CB), whereas a high driving force for reactions needs a larger band gap. To solve this issue, we introduced thermal energy into a photocatalytic system, leading to that the kinetic energy (from heat) compensates the insufficient driving force between the CB and reduction-potential levels (and between the VB and oxidation-potential levels). This has created a thermo-photo catalytic process, in which a catalyst with a small band gap can absorb light in a broad range from UV to visible/IR, while its weak driving force can be greatly enhanced by thermal energy, resulting in a tremendous enhancement for visible light photocatalytic water-slitting into hydrogen.

HIST 3923847

History of the fuel Chemistry Division and the transition with petroleum division to energy and fuels

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The Fuel and Gas Chemistry Division was started in 1925 and the name changed to Fuel Chemistry in 1960. Preprints were started in 1957. In 2012 Fuel Chemistry and Petroleum Divisions merged to form Energy and Fuels Division, but this merger was discussed as early as 1944. A history of FUEL will be presented. In addition, the awards connected to the division, the combination of FUEL and PETR awards in the merger and the new awards which have been added will be discussed. For example, the Henry H. Storch Award was started by FUEL in 1964 became a National ACS Award Sponsored by Exxon for a number of years then reverted back to a FUEL award. It became a ENFL award after the merger and in 2019 ENFL sponsored it as a ACS National award again.

HIST 3921825

Margaret Bryan: Newly discovered biographical information about the author of *A Compendious System of Astronomy* (1797)

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Margaret Bryan was an educator and author in England who wrote two intelligent and well-regarded textbooks on astronomy and physics intended to be read by young women, *A compendious system of astronomy* (editions in 1797, 1799 and 1805) and *Lectures on natural philosophy* (1806), along with a smaller volume, *Astronomical and geographical class book for schools* (1815). In addition to her work as an author, for about two decades she was the headmistress of a boarding school for young ladies. But Bryan has long been one of the mystery women of science. Despite over 200 years of interest in her and her life, almost nothing about her was known, including when and where she was born, her maiden name and the names of her parents, husband, and children, and when and where she died. This talk will be a detective story: it will describe how a small clue led to a trail of historical records that have – for the first time – brought Margaret Bryan out of the dark shadows in which she has been shrouded for two centuries. Possible connections with other women who wrote about science around the year 1800, such as Jane Marcet, author of *Conversations on Chemistry* (1806), will be discussed.

HIST 3914554

New National Historic Chemical Landmark: Dr. Marie Maynard Daly, the first African-American woman to receive a Ph.D. in chemistry

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On Friday, May 19, 2023, The New York ACS Local Section proudly dedicated a National Historic Chemical Landmark (NHCL) to honor Dr. Marie Maynard Daly, the first African American woman to earn a PhD in Chemistry. The landmark event took place at her *alma mater*, Columbia University, and included a distinguished symposium in Dr. Daly's honor, the screening of a brief biographical film, a ceremony, and a networking reception. Dr. Daly was a New York City native who earned an undergraduate degree at Queens College, a Master's degree at New York University and a Ph.D. in chemistry at Columbia University, then continued on to work as a scientist at Rockefeller University, Yeshiva University and Einstein College of Medicine. Due to her intelligence and passion for science, Dr. Daly made seminal contributions to our understanding of the biochemical processes including the development the first column chromatographic method for the separation of the nucleobases found in DNA and RNA that enabled her to show the 1:1 ratio of adenine to thymine and guanine to cytosine, an experimental confirmation of Chargaff's law. This work was critical to our understanding of the chemical structure of DNA and was duly cited by James Watson in his Nobel Prize address. Across her career, Dr. Daly was committed to increasing minority student enrollments in medical and graduate schools.This paper will present a comprehensive view of Dr. Daly's contributions to the chemical enterprise through the lens of the NHCL dedication.

HIST 3921094

Charlotte Roberts: Her 1896 stereochemistry textbook and some precursors

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Charlotte Roberts was a member of the first class entering Wellesley College and was the first female to be awarded the Ph.D. in Chemistry at Yale University. Subsequently, she became professor of chemistry and chair at Wellesley. She spent a sabbatical, during 1899-1900, studying with van't Hoff. Her textbook, *The Development and Present Aspects of Stereo-Chemistry* (Boston, 1896), was the first stereochemistry book published by an American-born author. The first authored, as opposed to translated, stereochemistry book published in the United States was *A Guide to Stereochemistry: Based on Lectures delivered at Cornell University with an Index to the Literature and an Appendix, Models for Use in Teaching Organic Chemistry...* (New York, 1892). Its author, Arnold Eiloart, a full-time Cornell faculty member, was a British citizen, who wrote *The Arrangement of Atoms in Space* (London, 1898), the second English translation of van't Hoff's ground-breaking work. Eiloart has a fascinating biography and, in the 1898 work, presented a novel explanation for the mirror-image optical activities of enantiomers.

HIST 3921969

Women chemical engineers and engineering couples in Norway 1910-1990: Support, obstacles, strategies

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Expectations were high when the Norwegian Institute of Technology opened doors in Trondheim in September 1910. For the first time Norway could train its own engineers, and hopes were high that the candidates graduating from the Institute would raise new industry, and this way, contribute to the building of the new, independent nation-state. Students were well aware of the privilege and status that were associated with being among “the flower of the youth of the nation” as the first generations of students at the Institute of Technology. Sixteen women graduated in (industrial) chemistry before the war, and the number of women who enrolled in this course more than doubled from the 1940s to the 1950s. After World War II, again engineers were central to the (re)building phase of the country. In a recent study of the first sixteen women chemical engineers, I have argued that mentorship, either from the close family (fathers, mothers, brothers, husbands), or their professors was important for the success of the women who were admitted to the Institute of Technology. In this lecture I will share the stories of some of the women who graduated from the chemistry course before and after the war. In particular, I will discuss the careers of those who married another chemist or engineer, and how they pursued careers as married women.

HIST 3924726

Madame Lavoisier and Madame Pasteur: Couple, family, and domesticity in chemical sciences

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Marie Anne Lavoisier, née Paulze (1758–1836) and Marie Anne Pasteur, née Laurent (1836-1910) are wives of celebrated chemists, whom they supported in their career, helping with writing, correspondence, or public communication. Both were also pivotal in memorializing their husbands after they passed, participating actively in the shaping of their historical figures. Both French, they lived in different times, Marie Anne Lavoisier dying the year Marie Pasteur was born. This talk will compare two wives of famous chemists who lived and investigate what we can learn from that comparison on the roles the played in the couple, the family, and the domestic settings of chemical sciences.

HIST 3920763

Teaching descriptive inorganic chemistry the Rayner-Canham way

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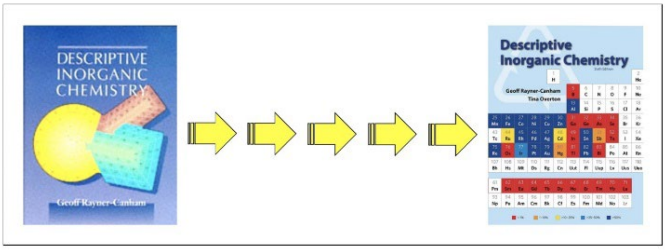
My professional career started in the Department of Chemistry at the University of North Carolina at Charlotte in 1996, the same year that the first edition of Geoff Rayner-Canham's *Descriptive Inorganic Chemistry* was published. This was fortuitous since one of my first tasks was to identify a suitable textbook for teaching the sophomore level inorganic chemistry course offered in the department every spring semester. The course I envisioned consisted of an overview of structure and bonding, a discussion of acids, bases, and redox chemistry, and a survey of the chemical elements and the synthesis, structure, and reactivity of their most common or important compounds, including an outline of the key industrial processes used to prepare them. That was exactly what Rayner-Canham's book offered, in a very readable and engaging fashion, and it became my textbook of choice for the next 20+ years. This presentation will showcase some of my favorite sections of the book and how they were adapted in my teaching of descriptive inorganic chemistry, including the Hall-Héroult process for the industrial production of aluminum.



HIST 3920788

Pioneering women in science: A philatelic tribute

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Marelene and Geoff Rayner-Canham have dedicated much of their scholarship since the 1980s to describe the lives and work of women in science, particularly those whose contributions to chemistry, radioactivity, and crystallography have not been properly recognized or simply forgotten. This presentation will use postage stamps to illustrate the pioneering research of women scientists, including some that are well-known (*e.g.,*Marie Curie, Dorothy Hodgkin, Rosalind Franklin, Ada Yonath) and some that are not (*e.g.,* Ana Kansky, Margarita Salas) but have been philatelically honored nevertheless.

HIST 3912722

Down the rabbit-hole: Research adventures in the history of women in chemistry

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Just as Alice had no idea of the adventures awaiting her down the rabbit-hole, the Rayner-Canhams had no idea that seeing a cameo portrait in Weeks and Leicester's *History of the Chemical Elements* was to totally change their life-path. This image was of Harriet Brooks, a student researcher with Ernest Rutherford at McGill University, Montreal, Canada. Their investigation of her previously-undocumented complex life became their first detective venture and their findings have had a significant impact in Canada. As the Rayner-Canhams descended ever deeper into the study of forgotten women chemistry pioneers, they found many 'side-passages' that needed exploring. One of these resulted in the discovery of other women scientists in the field of radioactivity. Then came a request from the A.C.S. to research and co-author a volume on the history of women in chemistry. This endeavor led to

uncovering yet more forgotten women chemists! The Rayner-Canhams discovered that women clustered in certain fields of chemistry, especially during the 1880-1940 time-frame. The exceptionally large number of early British women chemists provided many other avenues of discovery, including the women chemists in the First World War, and the forgotten pioneering chemistry-focussed British girls schools. In this presentation, the Rayner-Canhams will describe the complex saga of how one adventure led to another. Join them as they describe their descend into the unknown and unexpected!

HIST 3917857

… And yet more rarely recognized women chemists: An eclectic selection

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Quiz time! How many names of the following women chemists do you recognize? Keng Hsien-Seng? Marie Meudrac? Claudine Picardet? Chika Kuroda? Maud Menten? Erika Cremer? Margaret Lowe Benston? Princess Chulabhorn? Marian (Cole) Addy? In this presentation, we will span 2,000 years of women in chemistry and introduce you to overlooked women chemists from China, France, Japan, Canada, Germany, United States, Thailand, and Nigeria.

HIST 3927497

From women in chemistry to EDI: Making Canadian chemistry more inclusive

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Geoff and Marelene Rayner-Canham have spent decades illuminating the fascinating history of women in chemistry, often presenting in symposia on women in chemistry in addition to their many book on the subject. I first met Geoff in one of those wonderful symposia, where I learned much about the barriers preventing the full participation of women in chemistry, and the efforts being made to overcome those barriers. In 2016 I organized the first Canadian Society for Chemistry symposium on equity and diversity in chemistry, which was the first such symposium in Canada to focus on the intersecting experiences of gender, race, ability, ethnic origin, Indigenous identity, sexual orientation and gender identity. The proceedings were published in the book "Making Chemistry Inclusive." In this presentation I will discuss the journey that led me to organizing this symposium, and the subsequent centering of EDI as a priority within the Canadian Society for Chemistry.

HIST 3911582

Using demonstrations when discussing phlogiston theory

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Phlogiston theory was based on the idea that a fire-like, invisible substance is released during combustion. Proposed in the mid-1600s by Johann Hoachim Becher, and named by Georg Ernst Stahl, the theory dominated chemistry for almost 100 years. Experiments by Antoine Lavoisier and others eventually lead to the demise of phlogiston theory in the late 1700s. This time period provides an interesting story in the development of chemistry and an excellent example of how science evolves as empirical evidence is obtained. I will describe several simple demonstrations I find useful when discussing phlogiston theory in class and during outreach presentations.

HIST 3921464

Application of physical organic methods to the investigation of organometallic reaction mechanisms

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The modern era of organotransition metal chemistry arguably began with the synthesis and characterization of ferrocene in the early 1950's. For the following twenty years, the field grew substantially in both industrial and academic laboratories. While industry efforts relied on a trial-and-error approach to develop and improve catalysts, academic investigators focused on the structural characterization of new organotransition metal complexes and descriptive studies of their reactions. Although many unusual transformations were discovered during this period, the mechanisms of most of these reactions were poorly understood. In the late 1960's and 1970's, a few investigators began to address this dearth of mechanistic understanding. Inorganic chemists who were experts in kinetic investigations afforded one avenue towards gaining insights into organometallic reaction mechanisms. Yet another path was taken by young chemists trained in the physical organic tradition of people like Paul Bartlett, William Doering, Saul Winstein, and Jerome Berson. These groups, including mine at Caltech and subsequently UC Berkeley, began to tackle the problem of both discovering new organometallic chemistry and unraveling the mechanisms of these reactions. During the course of our investigations, we made inroads into the discovery and understanding of processes such as alkyne cyclization, nitric oxide migratory insertion and addition of metal nitrosyl complexes to alkenes, organometallic cluster complex formation, alkyne hydroamination, and carbon-hydrogen bond activation. This lecture will provide a personal overview of this work and a historical perspective of our contributions to mechanistic understanding in organotransition metal chemistry during the past 40 years.

HIST 3903393

Historical antecedents for organometallic chemistry developed in the Gladysz group: The mentors and prior investigators who made it possible

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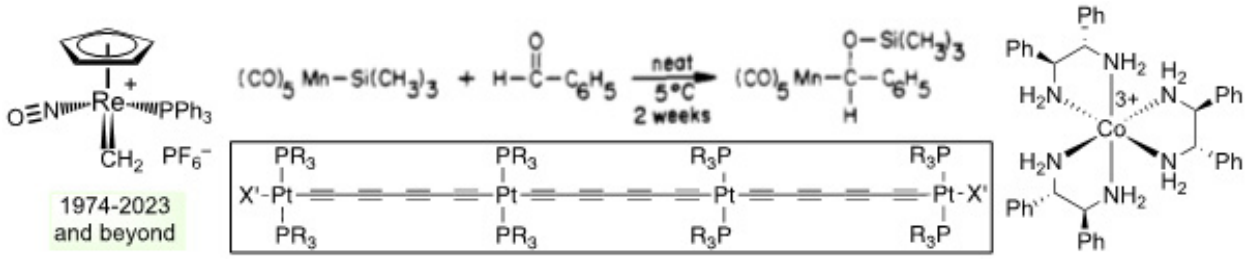
This is a personal talk describing the main historical influences upon the author's career in organometallic chemistry.[1] The first part will treat the environment for organometallic chemistry at Stanford (~1968-1975) and other chemists who evolved from this pool. The second will deal with additional influences that were important as the author established his independent research in C1, chiral-metal-alkylidene, trialkylborohydride,[2] metal-silane,[3] and metal-atom chemistry at UCLA (1974-1982). As time allows, later sources of inspiration for chemistry developed at Utah, Universität Erlangen-Nürnberg, and Texas A&M will be described.



HIST 3917221

Historical highlights of Organometallic Chemistry as noted from the N and S banks of the Rio Grande

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From MeLi to FpNa, Fp = $(C_5H_5)Fe(CO)_2]^-$, organometallic alkali metal salts have been invaluable tools to open an amazing range of chemistry across the Periodic Table. A selection of such chemistry, coupled with the stories associated with some of world's greatest organometallic chemists with a direct relationship to our border region, will be presented. Noteworthy is the distinctive vision dependent upon the viewing location, N vs S bank of the river.

HIST 3903392

Molecules that turn themselves inside-out: The historical roots of homeomorphic isomerization

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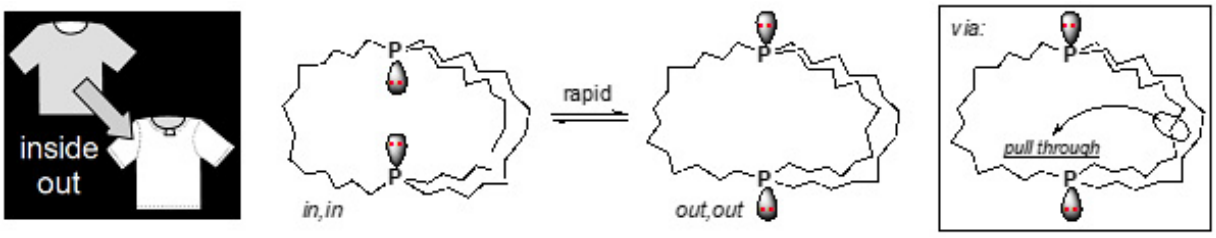
Although it is not generally appreciated, a sizable group of macrocyclic bicyclic molecules are capable of turning themselves inside-out, just like articles of clothing. This is known as homeomorphic isomerization, terminology imported from the field of topology. Half of this presentation will trace the history of this topic, for which important foundations were laid in Wilmington, Delaware[1] and Dresden, Germany,[2] and the allied concept of in/out isomerization.[3] The remainder will feature modern manifestations of this phenomenon,[4] in which interior and exterior functionalities of a molecule are exchanged. Applications in the selective transport of metal fragments will be described (e.g., separation of platinum, palladium, and nickel). The ACS abstract formatting rules required that references 1-4 be deleted but they will be provided in the presentation.



HIST 3922582

Franz Hein and the fascinating story of his “polyphenylchromium compounds”

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The history of Hein’s mysterious polyphenylchromium compounds dates back to 1919. Franz Hein was a research assistant at the University of Leipzig. In attempt to prepare triphenylchromium from PhMgBr and $CrCl_3$, he obtained an orange amorphous compound. The elemental analysis suggested the formation of $(C_6H_5)_5CrBr$ (“raw bromide”). The same compound he generated by the reaction of CrO_2Cl_2 and PhMgBr. At this point Hein was determined to continue the work of this type of chromium compounds. In 1921 Hein published more experimental details on the “raw bromide” and prepared various polyphenylchromium compounds containing three to five phenyl groups. For the preparation of some of the derivatives he applied electrochemical methods. Although Hein gathered an enormous amount of experimental data on his polyphenylchromium compounds, which he published in 1932, he still was very confused of the nature of the various neutral and ionic derivatives. The mystery was that all these polyphenylchromium compounds with assumingly different

oxidation states (IV, V, and VI) had nearly the same color and other same physical and chemical properties. Only 20 years later research by Harold H. Zeiss and Minoru Tsutsui as well as the groundbreaking synthesis of bis(benzene)chromium by E. O. Fischer and Walter Hafner in 1955 revealed that Franz Hein has prepared the first sandwich compounds, bis(biphenyl)chromium(I) complexes.

HIST 3894282

Edward Frankland and the birth of organometallics

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While examples of organometallics species such as Cadet's fuming arsenical liquid date back to the late 18th century, the term "organo-metallic" was introduced in 1852 by Edward Frankland (1825–1899), a professor of chemistry at the newly established Owen's College in Manchester (now the University of Manchester). Frankland had coined the term to describe various alkyl species of tin, antimony, arsenic, and mercury that he had successfully synthesized, beginning with the preparation of ethylzinc in 1849. He then went on to show that these compounds could be used to transfer the alkyl groups to a second metal via reaction with either the metallic element or its corresponding metal halide. This transfer of a ligand from one metal to another is now known as transmetalation, one of the fundamental reactions of modern organometallic chemistry. The life and career of Frankland will be presented with a focus on his preparation, study, and applications of organometallic species.

HIST 3922386

Early history of zinc in organic synthesis

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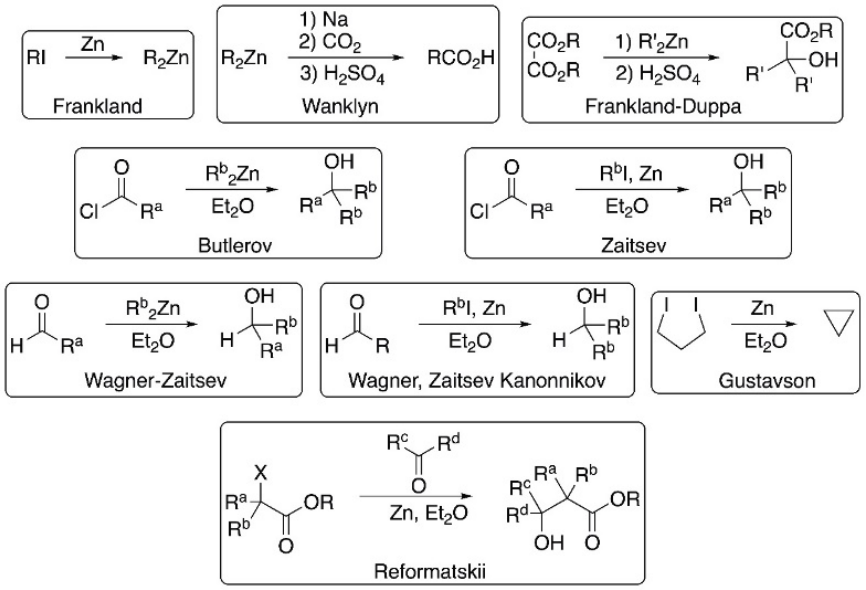
The era of organometalic chemistry began in 1849, with the synthesis of diethylzinc by Edward Frankland (1825-1899). This discovery became a cornerstone of what would evolve into the theory of valence. Nine years later, James Alfred Wanklyn (1834-1906), a student in Frankland's laboratory, reported the first synthesis of a zincate nucleophile, which he mistakenly identified as the alkylsodium. Early in the next decade, Frankland and his student, B(aldwin) F(rancis) Duppa (1828-1873) reported the reaction between dialkylzinc reagents and oxalate esters to give α,α-dialkyl-α-hydroxycarboxylate esters. The next major advance in the use of organozinc reagents came from Kazan Imperial University, in Russia, where Aleksandr Mikhailovich Butlerov (1828-1886), his student, Aleksandr Mikhailovich Zaitsev (1841-1910) pioneered the synthesis of tertiary alcohols from alkytlzinc reagents and acid chlorides. Zaitsev's student Yegor Yegorovich Vagner (Georg Wagner, 1849-1903), in Warsaw, extended the reaction further to include aldehydes and formate esters as the

carbonyl component. Zaitsev his students further extended these addiotions to permit the synthesis of symmetrical and non-symmetrical secondary alcohols. Sergei Nikolaevich Reformatskii (Serhiy Mikholayovich Reformats'kiy, 1860-1934), in Kiev, modified the reaction by replacing the alkyl (allyl) halide with an α-halocarboxylate ester to give the most enduring of the organozinc syntheses, the Reformatskii (Reformatsky) reaction. At the same time that Reformatskii was develoiping his reaction, Gavriil Gavrilovich Gustavson (1843-1908) reported a zinc-based analogue of the sodium-based Freund reaction for preparing cyclopropanes.



HIST 3922522

Carl Jacob Loewig (1803-1890): A pioneer of organometallic chemistry

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Carl Jacob Loewig was a chemist, educator, and chemical historian who made several very important contributions to chemistry. These include the discovery of bromine (published in 1828, soon after Balard) and a few of its compounds (cyanogen bromide, bromal, bromoform); the synthesis and studies of sulfur-containing organic compounds (notably isothiocyanates and some of the first synthetic – thioether- and disulfide-containing – polymers); and the preparation of some of the first organometallic substances of antimony (in 1850, i.e., the year after the publication of Edward Frankland’s work on organozinc compounds), tin (1852), and lead (1853). In this talk, Loewig’s most important findings will be described and put into perspective, with emphasis on his work in the field of organometallic chemistry.

HIST 3931378

Victor Grignard's contribution to organic chemistry

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François Auguste Victor Grignard was born on 6th May, 1871 in Cherbourg, France. He obtained his doctoral degree in 1901 on the research subject of organomagnesium compounds. He was a Professor, Head of Organic Chemistry Group, and Dean of Faculty of Sciences in University of Lyons. Victor Grignard was awarded Chemistry Nobel Prize 2012 for the discovery of organomagnesium compounds known under the name of Grignard reagents. Victor Grignard shared the Nobel Prize with Paul Sabatier. Grignard won several other awards, like Cahours Prize, Berthelot Medal, Lavoisier Medal, Honorary Fellow of the Chemical Society (London) and foreign member of the Royal Swedish Academy of Sciences. My presentation will include a historical perspective and some data on the mechanistic investigation of Grignard reactions.

HIST 3900742

Eclectic philatelic history of organometallic chemistry

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Organometallic chemistry, the study of compounds containing at least one chemical bond between a carbon atom and a metal, has a rich history that started more than 250 years ago. However, practical applications of such species were scant until the 1950s, when applications to olefin polymerization reactions emerged. It is now a much more mature field and organometallic compounds have a myriad of uses in organic synthesis, polymer chemistry, and industrial catalytic processes. This presentation will rely on the use of postage stamps and related philatelic materials to illustrate some milestones in the history of organometallic chemistry, including the early contributions of Edward Frankland, the well-known work of Victor Grignard, and the pioneering research of Ernst Fischer, Alexander Nesmeyanov, Karl Ziegler, Giulio Natta, and others. Organometallic compounds present in biological systems (*e.g.,* methylmercury, vitamin B_{12}) will also be discussed in the presentation.