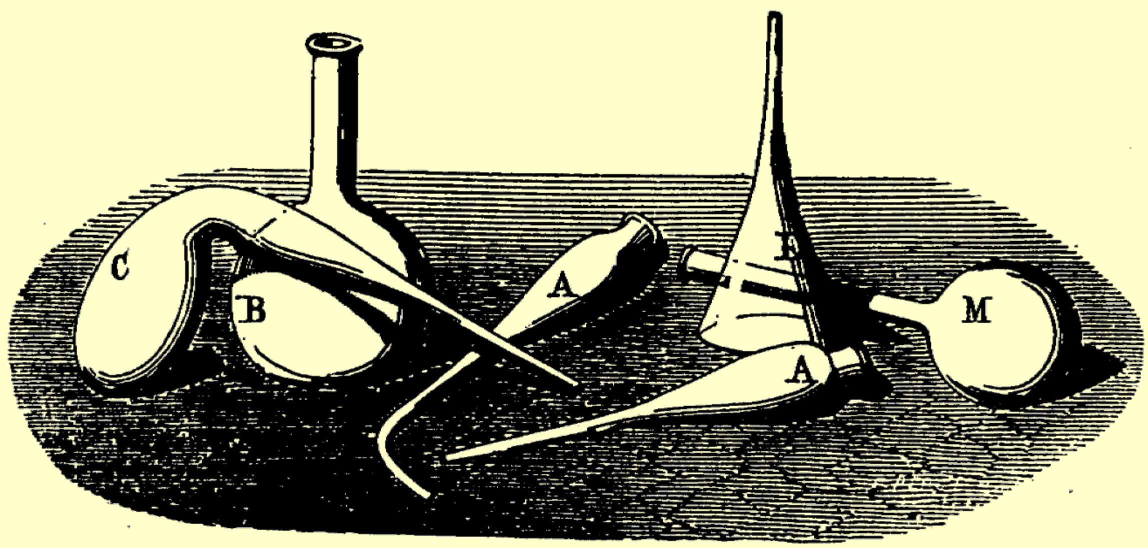
American Chemical Society

DIVISION OF THE HISTORY OF CHEMISTRY



PROGRAM & ABSTRACTS

261st ACS National Meeting
Online
April 5-30, 2021

Nicolay V. Tsarevsky, Program Chair

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HIST Programming

Message from the HIST Program Chair

Greetings to all my fellow historians of science, chemical educators, and history afficionados! On behalf of the Division of the History of Chemistry, I welcome you to our new programming! After a painfully long break, HIST will once again offer a number of interesting presentations and I sincerely hope you will attend many or even all of them.

The pandemic, which started just over a year ago, forced us to rethink and readjust many aspects of our lives. We quickly learned to do our jobs, attend performances, and even catch up with friends and relatives from home, taking advantage of the Internet and staring at a screen. Although many had reservations about (or even detested) the new style of communication, we soon began to appreciate the fact that we have a safe, efficient, and much more personal than the phone means to function and share thoughts with our colleagues, peers, and friends. Virtual business and scientific meetings, as well as lectures, became the norm. In this spirit, the 261st ACS National Meeting, originally planned to take place in San Antonio, TX, will be entirely virtual and will be markedly longer than usual (April 5-30, with live technical presentations taking place during the first two weeks, followed by two weeks of on-demand access).

We will begin our programming on Monday, April 5, with the postponed symposium on the *History of Polymer Science*, in which our audience will have the chance to gain knowledge about some important discoveries that not only yielded useful materials but have helped and inspired research in diverse disciplines, such as physics, biology and medicine, engineering, etc. We will also get acquainted, in a session aptly titled *Faces and Places*, with some of the "players" who transformed the discipline. The morning session of the next day, will be dedicated to a very successful series of books on the history of chemistry, *The Springer Briefs*, edited by our own Seth Rasmussen (my predecessor as Program Chair and current Chair of HIST). It has been more than a decade since the first books in the series appeared and this calls for a celebration. The attendees will learn about the subjects of some of the books but also meet the authors. We will finish our technical program with two *General Papers* sessions on Tuesday afternoon and evening. The detailed schedule and abstracts are presented on the following pages. When you expect them, you will see that a variety of topics will be covered during all HIST sessions. I am sure you will find the lectures to be enlightening and useful (perhaps in your teaching), and definitely enjoyable! We will also participate in one non-technical event. On the evening of Friday, April 9, please visit the HIST "virtual table" at *Division Row*. We will be thrilled to meet you and talk with you about the Division. Ideas from you are always welcome and much appreciated.

Last, you may remember the HIST-sponsored contest *Elemental Art*. We have received a number of contributions – cartoons, photographs, and poems – dedicated to the elements, their uses and discoveries, or the Periodic Table. We shifted the original deadline several times and as a result still have time to prepare and submit your original art, and to compete for the awards. The contest will close at the end of April 2021 and the winners will be announced in the fall. If the Muses visit you during the next month or so, please consider sending me your creative work at nvt@smu.edu or nicktsarevsky@gmail.com.

As always, we at HIST wish you a productive and fulfilling meeting and very much look forward to seeing you and talking with you at our sessions. We expect that our next meeting will be in person. Hope is certainly in the air and is almost palpable. Be well!

Nick Tsarevsky, HIST Program Chair

HIST SYMPOSIA, 261st ACS Meeting, April 5-30, 2021

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

UPCOMING MEETINGS AND HIST DEADLINES

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

262nd ACS Meeting, Atlanta, GA, August 22-26, 2021

African American Chemists: Academia, Industry and Social Entrepreneurship. (Invited and Seeking Contributions). Organizers: Taiya Fabre, Department of Chemistry, Mathematics and Physics, Houston Baptist University, Houston, TX 77074, Phone: 281-649-3191, email: tfabre@hbu.edu; Tracey Simmons-Willis, Department of Chemistry, Wharton County Junior College, Wharton, Texas 77488, Phone: 979-532-6572, e-mail: willist@wcjc.edu; Sibrina Collins, The Marburger STEM Center, Lawrence Technological University, Southfield, MI 48075, Phone: 248-204-2227; e-mail: scollins@ltu.edu

A. Ye. Chichibabin: The man and his chemistry. (Invited and Seeking contributions) David E. Lewis, Department of Chemistry and Biochemistry, University of Wisconsin-Eau Claire, Phone: 715-836-4744, email: lewisd@uwec.edu

Despite Disability. (Invited and Seeking contributions) David E. Lewis, Department of Chemistry and Biochemistry, University of Wisconsin-Eau Claire, Phone: 715-836-4744, email: lewisd@uwec.edu

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

263rd ACS Meeting, San Diego, CA, March 20-24, 2022

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

History of Glass (Invited and contributed) Seth C. Rasmussen, Department of Chemistry and Biochemistry, North Dakota State University, NDSU Dept. 2735, P.O. Box 6050, Fargo, ND 58108, Phone: 701-231-8747, email: seth.rasmussen@ndsu.edu; Dan Rabinovich, Department of Chemistry, UNC Charlotte, Charlotte, NC 28223, Phone: 704-687-5105, email: drabinov@uncc.edu

HIST Anniversary (Invited) Gary Patterson, Vancouver, WA 98661, 412-480-0656, email: gp9a@andrew.cmu.edu

HIST Award Symposium (Invited) Jeff Seeman, Department of Chemistry, University of Richmond, Richmond, VA 23273, email: jseeman@richmond.edu

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

264th ACS Meeting, Chicago, IL, August 21-25, 2022

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

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

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

Final Program

DIVISION OF THE HISTORY OF CHEMISTRY (HIST)

N. V. Tsarevsky, *Program Chair*

Zoom links for all sessions will be made available to registered attendees.
Please note that all times refer to Pacific Time (PDT).

Monday, April 5, 2021: Morning session (9:00 am – 12:00 pm PDT)

History of Polymer Science: Ideas and Materials

G. D. Patterson, S. C. Rasmussen, N. V. Tsarevsky, *Organizers*

9:00 Introductory remarks. **N. V. Tsarevsky**, **S. C. Rasmussen**

9:10 From polymer to macromolecule: origins and historical evolution of polymer terminology. **S. C. Rasmussen**

9:40 Early observations and studies of radical polymerization. **N. V. Tsarevsky**

10:10 History of poly (organophosphazenes). **H. Allcock**

10:40 Intermission

11:00 Following the PVC pipeline: Misconceptions and milestones from discovery to industrialization. **E. W. Culver**, S. C. Rasmussen

11:30 History vs. legend: Discovery and development of conducting polymers. **S. C. Rasmussen**

12:00 Business meeting – open to all
(https://american-chemical-society.zoom.com/j/6320555274)

Monday, April 5, 2021: Afternoon session (1:00 – 4:00 pm PDT)

History of Polymer Science: Faces and Places

G. D. Patterson, S. C. Rasmussen, N. V. Tsarevsky, *Organizers*

1:00 Introductory remarks. **G. D. Patterson**

1:10 The nifty fifty: Polymer scientists who created the discipline. **G. D. Patterson**

2:10 Professor Mihai Dimonie's contribution to polymer science and to the education of many generations of students at Politehnica University of Bucharest. **M. C. Stefan**, M. Teodorescu, H. Iovu

2:40 Intermission

3:00 Origin and development of polymer science in India: Historical Perspectives. **S. Sivaram**

3:30 Chemical philately: A stamp collector's view of polymer science. **D. Rabinovich**

Tuesday, April 6, 2021: Morning session (9:00 am – 12:00 pm PDT)

Springer Briefs in the History of Chemistry: The 10th Anniversary

S. C. Rasmussen, *Organizer*

9:00 Introductory remarks. **S. C. Rasmussen**

9:10 Life and achievements of Carl Auer von Welsbach, chemist, inventor, and entrepreneur. **M. V. Orna**, R. Adunka

9:40 John Winthrop, Jr.: The making of an adept. **G. D. Patterson**

10:10 Ten years on: How a springer brief led to a decade of Russian conferences. **D. E. Lewis**

10:40 Intermission

11:00 Writing *Frederick Sanger: Two-time Nobel Laureate in Chemistry*. **J. S. Jeffers**

11:30 How glass changed the world: Revised and expanded. **S. C. Rasmussen**

12:00 Networking session
(https://american-chemical-society.zoom.com/j/6320555274)

Tuesday, April 6, 2021: Afternoon session (1:00 – 4:00 pm PDT)

General Papers and Tutorial

N. V. Tsarevsky, *Organizer*

1:00 Introductory remarks. **N. V. Tsarevsky**

1:10 J. A. R. Newlands: beyond the law of octaves. **C. Giunta**

1:40 Astatine: the elusive one. **K. Kostecka**

2:10 Fritz Reitzenstein: A little known figure in the Werner-Jorgensen controversy. **David R. Manke**

2:40 Intermission

3:00 Withdrawn

3:30 Chemists with moral courage in France's Dreyfus Affair. J. Gal

Tuesday, April 6, 2021: Evening session (5:00 – 8:00 pm PDT)

General Papers and Tutorial

N. V. Tsarevsky, *Organizer*

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

5:30 William McPherson (1864-1951) and William Edwards Henderson (1870-1962): authors of an outstanding series of chemistry textbooks and manuals. **W. P. Palmer**

ABSTRACTS

Paper ID: 3531389

From polymer to macromolecule: origins and historical evolution of polymer terminology

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

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

Paper ID: 3554925

Early observations and studies of radical polymerization

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

By the close of the 19th Century numerous observations had been made related to the ability of unsaturated (vinyl and vinylidene) compounds to form thick oils or resinous substances with the same elemental composition as the starting material when stored and especially when heated or exposed to light. For instance, in 1835, Victor Regnault reported the polymerization of vinyl chloride and three years later, he described that vinylidene chloride, when stored in sealed ampoules, deposits a white non-crystalline substance, which he considered an isomeric form. While studying the properties of acrolein and acrylic acid in 1843, Josef Redtenbacher noticed that the former formed resin, named “disacryl”, when heated. In the same year, the formation of glass-like material from styrene (which refracted light very strongly and was “not improbable that it might be applied to several optical purposes”) was described by John Blyth and August Wilhelm von Hoffman. In fact, the “steady conversion of the oil [styrene] by air, light, and heat to a rubberlike substance” was communicated in 1839 by E. Simon who assumed the compound was styrene oxide. The nature of these and many other similar transformations was unclear and was the subject of speculations and (occasionally, lucky) guesses. There were indications that radicals were

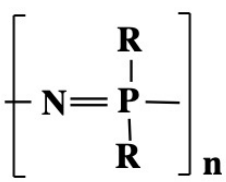
involved in the processes. For example, as early as 1924, Charles Moureu and Charles Dufraisse showed that hydroquinone, which inhibits the oxidation of acrolein (a chain reaction), also inhibits the formation of resin from it. In 1928, George Stafford Whitby and Morris Katz assumed that the chain growth in the thermal polymerization of indene (and presumably other unsaturated compounds) involved hydrogen migration. However, only within several years of these studies, the mechanism of radical polymerizations was already well understood and it was established that the reactions were comprised of three distinct steps (now termed initiation, propagation, and termination). Papers published in 1934 by William Chalmers, in 1935 by H. Dostal and Herman Mark, and by G. V. Schulz, and in 1937 by Paul Flory described the kinetics of the polymerizations as well as the molecular weight distribution functions of the polymers. The mentioned early studies of radical polymerization will be presented and discussed.

Paper ID: 3548630

History of poly (organophosphazenes)

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

The first poly(organophosphazenes) (1) were synthesized in the 1960's via a chemical reaction that most observers believed was impossible - the replacement of thousands of chlorine side atoms arrayed along an inorganic polymer chain by organic groups to yield stable macromolecules with unique properties. Today, several hundred different poly(organophosphazenes) with a wide range of unique property combinations have been produced by this same technique. Other synthesis methods have also been developed that include access to block- and graft-copolymers with classical organic macromolecules and poly(organosiloxanes). Applications that utilize the polymers are known that range from biomedical materials, aerospace elastomers, films, membranes, fibers, ionic conductors, and controlled surface materials. Many of these polymers are also resistant to combustion. This talk will trace the development of the field and its unique challenges. It is an example of the value of academic research coupled with the involvement of industry and government laboratories in the search for new property combinations and applications.



(1)

Paper ID: 3554598

Following the PVC pipeline: Misconceptions and milestones from discovery to industrialization

Evan W. Culver[1], *culver.evan@gmail.com, Seth C. Rasmussen*[2]. *(1) Chemistry and Biochemistry, North Dakota State University, Fargo, North Dakota, United States (2) Department of Chemistry and Biochemistry, North Dakota State University, Fargo, North Dakota, United States*

Historical accounts in chemistry have often been subject to biases that lead to incorrect claims and timelines of important scientific discoveries. One problem that is frequently encountered when telling the history of polyvinyl chloride (PVC) is who should be given credit for the discovery and when the discovery was made. A primary complicating factor seems to stem from a limited understanding of the macromolecule prior to the 1920s. The field in its infancy at this point would advance significantly due to the work by Herman Staudinger and happened to coincide with the patent submissions of Fritz Klatte which began the process of looking at industrialization and application. Additionally, the historical emphasis on plastics often ignores contributions that preceded the patenting and commercialization of polymeric products. The discovery of PVC has been incorrectly attributed to industry patents in the early 20th century, along with other erroneous attributions prior to and after the historically accepted account of Eugene Baumann in 1872. It is not to say that the contributions made in the 20th century were not substantial, as without the contributions of Fritz Klatte, industrial scalability would still have been out of reach. The presentation will focus on how PVC progressed from a material of only academic interest, to the billion-dollar industry we know today.

Paper ID: 3531394

History vs. legend: Discovery and development of conducting polymers

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

The discovery that the conductivity of conjugated organic polymers can be controlled through oxidation or reduction (i.e. doping) has led to organic materials that combine the electronic properties of metals with the weight and density of plastics. For this reason, such materials have been studied extensively and their importance has been recognized with the awarding of the 2000 Nobel Prize in chemistry to Alan Heeger, Alan MacDiarmid, and Hideki Shirakawa “for the discovery and development of conductive polymers.” Due to the wording of this award, as well as other factors, the common view has become that these materials originated with the collaborative work of the Nobel Laureates on doped polyacetylene in the late 1970s. At odds with this view, however, are numerous similar reports of conducting organic polymers dating back to 1963. An overview of the history of conjugated polymers from their origin in 1834 up through the rapid expansion of these materials in the 1970s and 80s will be presented, with a focus on the known reports of conducting polymeric materials.

Paper ID: 3530017

The nifty fifty: Polymer scientists who created the discipline

***Gary D. Patterson**, gp9a@andrew.cmu.edu. Carnegie Mellon University, Pittsburgh, Pennsylvania, United States*

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

Paper ID: 3553879

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

***Mihaela C. Stefan**[1], mci071000@utdallas.edu, Mircea Teodorescu[2], Horia Iovu[2]. (1) Dept Chem UT Dallas, Richardson, Texas, United States (2) Polymer Science, Universitatea Politehnica din Bucuresti Facultatea de Stiinte Aplicate, Bucuresti, Romania*

Professor Mihai D. Dimonie was born in Ploiesti (Romania) on January 17, 1934. He received his BS in Chemical Engineering from Politehnica University of Bucharest (Romania) with specialization in Organic Compounds Technology. He received his Ph.D. in Chemistry under the supervision of S.S. Medvedev from Lomonosov Moscow Institute of Fine Chemical Technology in 1965. He joined the Department of Organic and Macromolecular Compounds at Politehnica University (Bucharest) in 1957 as Junior Assistant Professor. He was promoted to Assistant Professor in 1965, to Associate Professor in 1969, and Professor in 1980. Professor Dimonie was the Head of the Department of Technology of Organic and Macromolecular Compounds in the period 1990 to 2004. He was also the Head of the Elastomers Department at the National Institute of Chemical Research (ICECHIM) in 1990 and 1991. Professor Dimonie taught Technology of Polymer Synthesis, Ionic and Coordination Polymerizations, Ring Opening Polymerizations, Emulsion Polymerizations, Stereospecific Polymerizations, and Modern Methods for Investigation of Polymerization Processes undergraduate and graduate courses. He advised the dissertation theses of ~200 undergraduate students, and he advised ~30 Ph.D. students in his entire career. The Polymer Technology course he developed and taught for more than 40 years was the most crucial course for undergraduate students who majored in Chemical Engineering with Polymer Science Specialization. Professor Dimonie published more than 300 papers, four books, and 35 patents in the field of polymer science and technology. He received the Nicolae Teclu

Award of the Romanian Academy in 1980 and the Opera Omnia Award from Politehnica University of Bucharest for his entire scientific career. Professor Dimonie published papers in heterogeneous media polymerizations, ionic and coordination polymerizations, ring-opening polymerizations, composites and nanocomposites, and polymer additives for road bitumen. His most recognized research in the field of ring-opening metathesis polymerization targeted the synthesis of polypentenamer and polyoctenamer elastomers. Professor Dimonie was a role model for students and an outstanding mentor who shaped the careers of many of his students. Professor Mihai Dimonie's contribution to polymer science and the education of many generations of students at the Politehnica University of Bucharest.

Paper ID: 3555831

Origin and development of polymer science in India: Historical Perspectives

***Swaminathan Sivaram**, sivaramswaminathan01@gmail.com. Department of Chemistry, Indian Institute of Science Education and Research, Pune, Maharashtra, India*

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

Paper ID: 3552214

Chemical philately: A stamp collector's view of polymer science

***Daniel Rabinovich**, drabinov@uncc.edu. Dept. of Chemistry, University of North Carolina at Charlotte, Charlotte, North Carolina, United States*

This presentation will rely on the use of postage stamps to illustrate the history of polymer science, starting with natural polymeric materials known for centuries, such as silk and caoutchouc. Milestones in the development of early polymer chemistry will be described, including the work of Schönbein on nitrocellulose, Chardonnet's production of artificial silk, the beginning of the textile industry, and the vulcanization of rubber. Contributions from key personalities in the history of plastics, such as Baekeland, Staudinger, Flory, Ziegler, and Natta, will also be discussed. Last but not least, an array of fascinating topics that are

(unexpectedly) found on postage stamps will be presented, for example hydrogels and the pioneering research of Otto Wichterle, the introduction of plastic banknotes, and the evolution of conductive polymers.

Paper ID: 3530038

Life and achievements of Carl Auer von Welsbach, chemist, inventor, and entrepreneur

Mary Virginia Orna[1], *maryvirginiaorna@gmail.com, Roland Adunka*[2]. *(1) Chemistry, The College of New Rochelle, New Rochelle, New York, United States (2) Auer von Welsbach Museum, Althofen, Carinthia, Austria*

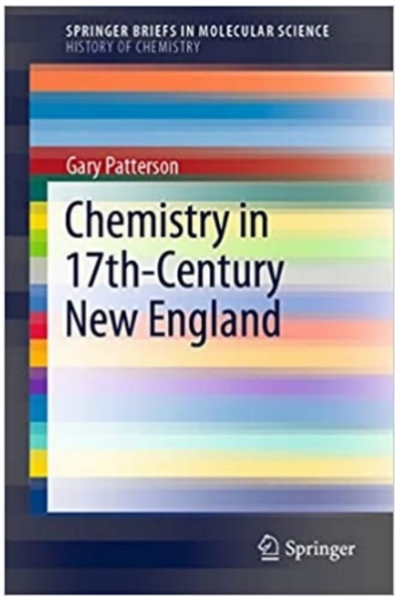
Carl Auer von Welsbach was considered the most important chemist in Austria spanning the decades from the late 19th through the third decade of the 20th century. Following postdoctoral study in the laboratory of Robert Bunsen, he went on to do pioneering work on the rare earth elements, including the discovery of new elements. As a result of his knowledge of the rare earths, he was able to develop new materials for a variety of practical uses, to invent useful new devices, and to found major industries. Throughout his career, he was at the forefront of scientific developments, maintaining correspondence and networking with such major scientists as William Ramsay, Niels Bohr, Ernest Rutherford, Lise Meitner and Max Planck.

Paper ID: 3530144

John Winthrop, Jr.: The making of an adept

Gary D. Patterson, *gp9a@andrew.cmu.edu. Carnegie Mellon University, Pittsburgh, Pennsylvania, United States*

This talk is based on a chapter in the recent book: *Chemistry in 17th Century New England.* How is it that the Colonial Governor of Connecticut was universally recognized as an adept? How could he have been a founding member of the Royal Society of London? How could he have been the Father of industrial chemistry in Colonial America? This is a fascinating story and one that every American chemist should know.



Paper ID: 3554334

Ten years on: How a springer brief led to a decade of Russian conferences

David E. Lewis, *lewisd@uwec.edu. Department of Chemistry and Biochemistry, University of Wisconsin-Eau Claire, Eau Claire, Wisconsin, United States*

In 2012, my SpringerBrief, *Early Russian Organic Chemists and Their Legacy* was published, and I sent a copy of the book to Academician Konovalov in Kazan, with whom I had corresponded nearly two decades earlier. Our correspondence lapsed because I was moving, so we lost contact. Since his receipt of my book, doors that I never imagined existed have opened for me to speak at universities in Russia: Ekaterinburg, Kazan, Moscow, St. Petersburg, Tomsk and Vladikavkaz. In this rather personal account, I will discuss the evolution of my research in the history of chemistry in the light of its genesis in that one little book.

Paper ID: 3560371

Writing *Frederick Sanger: Two-time Nobel Laureate in Chemistry*

Joe S. Jeffers*, jeffers@obu.edu. Ouachita Baptist Univ, Arkadelphia, Arkansas, United States*

This biography is based on reading the works of Fred Sanger and conducting 18 hours of interviews with Sanger over a period of ten years. Additionally, more than 40 of Sanger's students, colleagues, and family members were interviewed. The assembling of that story will be presented.

Paper ID: 3531385

How glass changed the world: Revised and expanded

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

Glass and its uses predate recorded history. The production of synthetic glass, however, is thought to date to no earlier than 3000 BCE. Such glass technology was not discovered fully fashioned, but grew slowly through continued development of both chemical composition and techniques for its production, manipulation, and material applications. This development had become fairly advanced by the Roman period, resulting in a wide variety of glass vessels and the initial use of glass windows. After the fall of the Roman Empire, glass technology was further advanced in Venice and Murano, where improvements in composition and production resulted in both more chemically stable and clearer forms. The quality of this new glass ushered in the development of lenses and eyeglasses, as well as the greater use of glass as a material for chemical apparatus, all of which significantly impacted society and the pursuit of science. Finally, glass in the North developed along different lines to ultimately result in a new form of glass that eventually replaced Venetian glass. This Bohemian glass became the glass of choice for chemical glassware and dominated the chemical laboratory until the final advent of borosilicate glass in the 1880s. A brief overview of the early history of silica glasses from their origins to the development of borosilicate glasses will be presented.

Paper ID: 3536057

J. A. R. Newlands: beyond the law of octaves

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John Alexander Reina Newlands (1837-1898) is remembered today by historians of chemistry for one thing, namely being one of those who independently discovered the periodic law; he called his version the “law of octaves.” This presentation examines other aspects of Newlands’s life and work. For example, Newlands was one of a group of volunteer soldiers who served under Garibaldi for the unification of Italy, and he had a volume of verse published at about the same time when the Chemical Society of London declined to publish a paper on the law of octaves. Analytical chemistry and the production of sugar were Newlands's principal occupations. The law of octaves was not his only foray into chemical classification and systems, or even his first: he wrote about classification in organic chemistry and systematic organic nomenclature as well.

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Astatine: the elusive one

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Astatine has proven, since its isolation by Corson, Mackenzie and Segre in 1940 to be an element with a fascinating history with respect to its discovery, confirmation and naming. It has also proven to have an interesting set of physical and chemical properties as well as isotopes of significant note. This element also has several applications of note as well as a captivating chemistry and the question whether it is or is not diatomic.

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Fritz Reitzenstein: A little known figure in the Werner-Jorgensen controversy

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This presentation will examine the life of Fritz Reitzenstein, a chemistry faculty member at the University of Würzburg at the turn of the 20th century. The talk will examine his birth, education, research, involvement in the German Chemical Society, and his final years. There will be specific focus on his involvment in the Werner-Jorgensen controversy.

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Chemists with moral courage in France's Dreyfus Affair

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French Jewish army captain Alfred Dreyfus was falsely prosecuted and convicted of treason in 1894, in what became the infamous antisemitic Dreyfus Affair, one of the most egregious miscarriages of justice in history. He was imprisoned for almost five years under appalling conditions on Devil's Island, off the northern coast of South America. In 1899, Dreyfus was pardoned but only in 1906 was he exonerated by France's highest court. Many in France among the population at large, in the government, among intellectuals, scientists, and artists, etc., believed in Dreyfus' guilt. Some, however, recognized his innocence and courageously defended him. Such principled supporters included some eminent chemists, e.g., Édouard Grimaux and Auguste Scheurer-Kestner. Grimaux (1835-1900), chemist, pharmacist, and member of the French Academy of Sciences, was professor at the *École polytechnique*, a prestigious university-level educational institution in Paris. His research in organic chemistry had important industrial applications. In 1898 he signed a petition to the Parliament requesting a review of Dreyfus' conviction and testified in defense of renowned French writer Émile Zola during the latter's prosecution for defamation, a baseless charge levelled at Zola for his pro-Dreyfus stand. For testifying in defense of Zola, Grimaux was dismissed from his professorship, and his ordeal is thought to have contributed to the health problems that led to his death. Scheurer-Kestner (1833-1899) was an industrial chemist, director of a chemical factory, and researcher in a variety of industrial-chemical problems. He was also an eminent politician, and he fearlessly defended Dreyfus, which cost him his political career, his friends abandonned him, and he suffered fierce attacks from French politicians and the press. He died on September 19, 1899, the very day Dreyfus was pardoned by Émile Loubet, the president of France. Scheurer-Kestner is considered today a historical figure of great moral authority in France.

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

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The deaths of Beilstein (1906), Mendeleev (1907) and Menshutkin (1907), following the deaths of Markovnikov (1904) and Vagner (Wagner, 1903) signaled the end of an era in organic chemistry in the Russian Empire. Each of these chemists in one way or another is well known to modern organic chemists: Mendeleev through his Periodic Table, and the others through eponymous reactions, rules and tests. One of the less appreciated members of this group, Nikolai Aleksandrovich Menshutkin (the first Editor of the *Journal of the Russian Chemical Society*), is the subject of this paper. In an era when organic chemistry was basically

a qualitative science, Menshutkin was among the first to obtain quantitative data for the influence of structure on the rates of chemical reactions. In one study, he studied the rates of quaternization of tertiary amines with alkyl bromides and iodides, a reaction that has come down to us as the Menshutkin reaction. However, this was not the only reaction he studied. He also studied the effects of structure on the rate of the Williamson ether synthesis, and the effects of alcohol structure on the rates of esterification. Menshutkin's life and chemistry will be explored.


Nikolai Aleksandrovich Menshutkin

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William McPherson (1864-1951) and William Edwards Henderson (1870-1962): authors of an outstanding series of chemistry textbooks and manuals

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William McPherson was born near Xenia, Ohio in 1864. He attended Ohio State University obtaining B. S, M.S. and Sc.D. degrees. He obtained a Ph.D. degree from the University of Chicago and also completed about five years teaching in High Schools. He returned to Ohio State University as assistant to Professor Sidney A. Norton in 1892 where he had an illustrious career until his second retirement in 1938. William Edwards Henderson was born in Wilkinsburg, Pennsylvania in 1870. He attended Wooster College obtaining a B. A degree in 1891. He obtained his Ph.D. degree from Johns Hopkins University in 1897. He taught at Ohio State University from 1899 to 1941. McPherson and Henderson both saw the tremendous increase in the popularity of chemistry reflected in student numbers in the early part of the twentieth century. Observing this trend, they wrote a book, *Elementary study in chemistry* (1905), for High School and first year College chemistry students which included more physical chemistry than other textbooks of the period. This was followed by a chemistry laboratory manual entitled *Exercises in chemistry* in 1906. They published over twenty different manuals and textbooks in a variety of editions, providing an introduction to chemistry for an estimated two million students; they are thus amongst the most widely used chemistry textbooks ever published. The McPherson and Henderson manuals are usually owned by individual students. The students perform the experiments as indicated in the manual and fill in answers in the spaces provided. Each manual is thus a unique notebook of the student's results. The "William Palmer" collection contains about 370 different of such manuals collected using Ebay over twenty years and *Exercises in chemistry* is the most numerous manual title in the collection.