American Chemical Society
Division of the History of Chemistry

# Program and Abstracts

234th ACS National Meeting
Boston, MA
August 19-23, 2007

J. S. Jeffers, Program Chair

# DIVISION OF THE HISTORY OF CHEMISTRY

**Chair**: Roger A. Egolf
Pennsylvania State University -
Lehigh Valley Campus
8380 Mohr Lane
Fogelsville, PA 18051-9999
Phone: (610) 285-5110
Fax: (610) 285-5220
Email: rae4@psu.edu

**Chair Elect**: Janan M. Hayes
Merced College (retired)
6829 Barbara Lee Circle
Sacramento, CA 95842
Phone: (916) 331-6886
Email: jmhayes@earthlink.net

**Past Chair**: Jeffrey I. Seeman
SaddlePoint Frontiers
12001 Bollingbrook Place
Richmond, VA 23236-3218
Phone: (804) 794-1218
Email: jiseeman@yahoo.com

**Secretary-Treasurer**: Vera V. Mainz
University of Illinois Urbana-Champaign
School of Chemical Sciences
142B RAL, Box 34 Noyes Lab
600 S. Mathews Ave.
Urbana, IL 61801
Phone: (217) 244-0564
Fax: (217) 244-8068
Email: mainz@uiuc.edu

**Program Chair**: Joe Jeffers
Ouachita Baptist University
410 Ouachita Street, Box 3786
Arkadelphia, AR 71998-0001
Phone: (870) 245-5216
Fax: (870) 245-5241
Email: jeffers@obu.edu

***Bulletin* Editor**: Paul R. Jones
University of Michigan
Department of Chemistry
Ann Arbor, MI 48109-1055
Fax: (734) 647-4865
Email: prjones@umich.edu

**Councilor**: Mary Virginia Orna
Department of Chemistry
College of New Rochelle
New Rochelle, NY 10805
Phone: (914) 654-5302
Fax: (914) 654-5387
Email: mvorna@cnr.edu

**Councilor**: Ben B. Chastain
538 Hampton Drive
Birmingham, AL 35209
Phone: (205) 871-3859
Email: bbchasta@samford.edu

**Alternate Councilor**: Carmen Giunta
Le Moyne College
1419 Salt Springs Rd.
Syracuse, NY 13214-1399
Phone: (315) 445-4128
Fax: (315) 445-4540
Email: giunta@lemoyne.edu

**Archivist/Historian**: James J. Bohning
Dept. of Chemistry, Lehigh University
6 E. Packer Ave.
Bethlehem, PA 18015
Phone: (610) 758-3582
Fax: (610) 758-6536
Email: jjba@lehigh.edu

# HIST

## DIVISION OF THE HISTORY OF CHEMISTRY

### 234th ACS National Meeting, Boston, MA, August 19-23, 2007

J. S. Jeffers, *Program Chair*

**SOCIAL EVENTS:**
**Edelstein Dinner, Dom's Italian Restaurant, 7:00 pm, $45:** Tue
**HIST Business meeting, 8:30 am:** Mon

### SUNDAY MORNING

Seaport Hotel -- Plaza C http://www.seaportboston.com/

**General Papers**

J. S. Jeffers, *Organizer*, *Presiding*

**8:45 —1.** Americium: From discovery to the smoke detector and beyond. **K. Kostecka**
**9:10 —2.** Beilstein, Menshutkin and Mendeleev: End of an era. **D. E. Lewis**
**9:35 —3.** You are there: Teaching the history of chemistry where it happened. **H. E. Pence**
**10:00 —4.** Brief history of the Medical Research Council Laboratory of Molecular Biology, Cambridge, UK. **J. S. Jeffers**
**10:25 —** Intermission.
**10:40 —5.** Echoes of great deaf chemists. **T. Pagano**, H. G. Lang
**11:05 —6.** James Young (1811-1883): Chemist, capitalist, and catalyst for the founding of the American petroleum industry. **M. D. Saltzman**
**11:35 —7.** Napoleon, Berthollet, and the Law of Mass Action. **D. F. Martin**, B. B. Martin

Boston Convention and Exhibition Center (BCEC), Room 207
http://www.massconvention.com/bcec_flo.html

**Wolfrom/Isbell/New Investigator Award Symposium**

*Sponsored by CARB, Cosponsored by BIOL, MEDI, ORGN, BIOHW, and HIST*

### SUNDAY AFTERNOON

Seaport Hotel -- Plaza C http://www.seaportboston.com/

**General Papers**

J. S. Jeffers, *Organizer, Presiding*

**1:30 —8.** Chemical history and the Holocaust. **E. Klingsberg**
**1:55 —9.** First annual ACS "Institute of Chemistry" in 1927: Grand experiment in chemical education. **R. A. Olofson**, K. A. Yarmey
**2:20 —10.** History of chemistry resources on the internet. **C. J. Giunta**
**2:45 —11.** Illustrations of chemical substances in some earlier Chinese writing. **B. Ramsay**
**3:10 —** Intermission.
**3:25 —12.** Paul Bartlett's mission: Bringing the message of mechanism to industrial research laboratories. **S. J. Weininger**
**3:50 —13.** Dr. Frankenstein, the lye of blood, and the beginning of chemical synthesis. **S. A. Koch**
**4:15 —14.** Prolegomena to a science of macromolecules. **G. D. Patterson**

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## MONDAY MORNING

Seaport Hotel – Plaza C http://www.seaportboston.com/

**8:30 —** HIST Business Meeting

**Classic Chemistry Books of the Twentieth Century 4: Spectroscopy**

*Cosponsored with Bolton Society*
R. K. Smeltzer, *Organizer, Presiding*

**8:50 —** Introductory Remarks.
**9:00 —15.** Spectroscopy and the quantum revolution: Old quantum theory gives way to quantum mechanics. **K. R. Metz**
**9:40 —16.** Spectroscopy and the periodic table: Tribute to Friedrich Hund's *Linienspektren und periodisches System der Elemente*. **W. B. Jensen**
**10:20 —** Intermission.
**10:35 —17.** Gerhard Herzberg: physicist, chemist and astronomer. **D. C. Morton**

**11:15 —18.** Raising the bar for those who followed: Henry Rowland and the solar spectrum. **S. C. Turner**

## MONDAY AFTERNOON

Seaport Hotel -- Plaza C http://www.seaportboston.com/

**Classic Chemistry Books of the Twentieth Century 4: Spectroscopy**

*Cosponsored with Bolton Society*
R. K. Smeltzer, *Organizer, Presiding*

**1:30 —19.** A brief history of light scattering spectroscopy. **G. D. Patterson**
**2:10 —20.** Vibrational and vibration-rotational molecular spectroscopy 1900-1960. **A. Weber**
**2:50 —** Intermission.
**3:05 —21.** Chemistry of the stars: Scheiner & Frost's treatise on astronomical spectroscopy. **R. S. Brashear**
**3:45 —22.** Two classics of early American solar spectroscopy. **R. L. Kremer**

Boston Convention and Exhibition Center (BCEC) -- Exhibit Hall – B2 **MONDAY EVENING**

http://www.massconvention.com/bcec_flo.html

**Sci-Mix**

J. S. Jeffers, *Organizer*

**8:00 - 10:00**

**2, 10-11.** See previous listings.

## TUESDAY MORNING

Boston Convention and Exhibition Center (BCEC), Room 205A
http://www.massconvention.com/bcec_flo.html

**Going With the Information Flow: Chemical Abstracts Service 100th Anniversary Presidential Symposium**

*Sponsored by PRES, Cosponsored with HIST, CINF, CHED*

J. E. Mears, *Organizer;* E. Shively, *Organizer;* M. V. Orna, *Organizer, Presiding*

**8:30 —**Introduction: Science in the 20th Century. **M. V. Orna**.

**8:35 — 6.** An impressionistic look at the history of CAS. **R. J. Massie**
**9:10 — 7.** The CAS database: back to the future. **C. Maulbecker**
**9:45 — 8.** The importance of CAS to the world's scientists. **H. Chihara**
**10:20 — 9.** Chemical Abstracts service: its role in the history and evolution of scientific information. **B. Lawlor**
**10:55 — 10.** SciFinder: it's part of the R&D process. **D. Ridley**
**11:30 —**Concluding Remarks: **C. T. Hunt**, ACS President.

## TUESDAY AFTERNOON

Seaport Hotel -- Plaza C http://www.seaportboston.com/

**Edelstein Award Symposium Honoring Anthony S. Travis**

J. J. Bohning, *Organizer, Presiding*

**1:45 —** Introductory Remarks.
**1:50 —23.** Color: Whether pigment or dye, a delight for the eye. **M. V. Orna**
**2:20 —24.** Madder on the Monacacy: Eighteenth-century Moravian dye works in Pennsylvania. **J. J. Bohning**
**2:50 —25.** Messages from dye sample books: technical, commercial, and cultural. **M. E. Bowden**, E. McLeary
**3:20 —** Intermission.
**3:35 —26.** Dyeing for a tariff: American politics and German chemicals after World War I. **K. Steen**
**4:05 —27.** "What a wonderful empire is the organic chemistry". **A. S. Travis**
**4:55 —** Edelstein Award Presentation, Roger Egolf, HIST Chair.

## TUESDAY EVENING

**Edelstein Award Dinner**

J. S. Jeffers, *Organizer*

**7:00-9:00 —**Dom's Italian Restaurant, $45.00, http://www.domsboston.com/

## *Abstracts*

**HIST 1 Americium: From discovery to the smoke detector and beyond**
***Keith Kostecka**, Science and Mathematics Department, Columbia College -Chicago, 600 S. Michigan Avenue, Chicago, IL 60605, Fax: 312-344-8075, kkostecka@colum.edu*

Americium has proven, since its isolation by Seaborg and Ghiorso in 1944, to bean element that has proven useful as well as problematic. Discussion of the discovery of this element, its notable characteristics, isotopes, and applications (including in smoke detectors and use as a portable gamma ray source) will be offered. The chemistry of Americium will also be discussed in the context of scientific work being done to reduce the medium term radio-toxicity of the waste from the reprocessing of used nuclear fuel.

**HIST 2 Beilstein, Menshutkin and Mendeleev: End of an era**
***David E. Lewis**, Department of Chemistry, University of Wisconsin-Eau Claire, Eau Claire, WI 54702, Fax: 715-836-4979, lewisd@uwec.edu*

The four-month period from October, 1906, to February, 1907, witnessed the deaths of three of the founding members of the Russian Physical-Chemical Society: Friedrich Konrad (Fedor Fedorovich) Beilstein, Nikolai Aleksandrovich Menshutkin, and Dmitrii Ivanovich Mendeleev. This brief period also signaled the end of an era in Russian chemistry in general and Russian organic chemistry in particular. Of the remaining organic chemists who had reached their zenith during the 19th century, only Zaitsev remained, and he, too, would be deceased by the end of the decade. The young chemists who would replace these 19thcentury giants all survived well into the Soviet era; two (Chichibabin and Ipatiev) would flee their mother country and be stripped of their standing as Academicians. The three chemists in the title of this paper shared a complex relationship that will be explored in this talk.

**HIST 3 You are there: Teaching the history of chemistry where it happened**
***Harry E. Pence**, Dept. of Chemistry and Biochemistry, State University of New York, Oneonta, NY 13820, Fax: 607-436-2654, pencehe@oneonta.edu*

What if you could teach about the origins of alchemy in a reconstructed Egyptian temple or in ancient Rome? What if you could teach about John Dee and English alchemy in a Renaissance village, the chemical revolution of Lavoisier in an 18$^{th}$ century French town, atomic structure in Paris in 1900, or space science inside of a life-sized Saturn rocket? Between classes you could take your students to the Globe Theater or the Moulin Rouge for an evening of relaxation. The on-line, 3D, virtual world called Second Life offers realistic simulations of these educational venues and many others, and you can enjoy it without cost. As far as I know, no one has taught History of Chemistry in Second Life yet, but it is as close as your computer, and even more historical environments will soon be available. Just select your avatar and join the hundreds of colleges, businesses, and government agencies that have already become part of Second Life. If you can imagine it, Second Life can make it real - - - almost!

**HIST 4 Brief history of the Medical Research Council Laboratory of Molecular Biology, Cambridge, UK**
***Joe S. Jeffers**, Department of Chemistry, Ouachita Baptist University, 410 Ouachita Street, Box 3786, Arkadelphia, AR 71998-0001, Fax: 870-245-5241, jeffers@obu.edu*

In 1947, Britain's Medical Research Council formed a Unit for “Research on the Molecular Structure of Biological Systems” to support work by Max Perutz and John Kendrew in developing X-ray diffraction studies of proteins. These early studies in the Cavendish Laboratories of Cambridge University were followed by the DNA structural work of James Watson and Francis Crick and, in Biochemistry, the protein sequence work of Fred Sanger. These studies and others lead to the building of a new facility off campus on Hills Road in

Cambridge. The new facility, opened in 1962, was named the MRC Laboratory of Molecular Biology. In its sixty year history, the LMB has been home to thirteen Nobel Laureates, all conducting their seminal work at the LMB. This paper will provide a brief history of the lab.

**HIST 5 Echoes of great deaf chemists**

***Todd Pagano**, Laboratory Science Technology program, Rochester Institute of Technology/ National Technical Institute for the Deaf, 52 Lomb Memorial Drive, Rochester, NY 14623, tepnts@rit.edu, and Harry G. Lang, Department of Research and Teacher Education, Rochester Institute of Technology/ National Technical Institute for the Deaf, Rochester, NY 14623*

The deaf chemist of the past probably relied on lecture notes from classmates, missed considerable verbal information on the job, and in an extreme case, might not have even been able to follow the spoken word during his own Nobel Prize award ceremony. Despite the fact that they could not hear, the contributions of these chemists sounded great discovery throughout the scientific community. Deaf chemist, Sir John Cornforth, was awarded the Nobel Prize in chemistry for his work on the stereochemistry of enzyme-catalyzed reactions. Another deaf pioneer, Anders Ekeberg, not only discovered the periodic element Tantalum, but also mentored his student to go on to discover five other elements. Nansie Sharpless was discouraged to become an 'over-educated' deaf female as she pursued her doctorate, yet published numerous biochemical articles and book chapters that helped to induce the current understanding of some neurological disorders. We hope to shed light on some of the contributions of these chemists and their numerous deaf contemporaries, whose pioneering work still echoes in many of today's discoveries.

**HIST 6 James Young (1811-1883): Chemist, capitalist, and catalyst for the founding of the American petroleum industry**

***Martin D. Saltzman**, Natural Science, Providence College, 549 River Avenue, Providence, RI 02918, msaltzmn@providence.edu*

James Young was a cabinet maker by training and despite any substantial formal education would through his chemical work change the nature of Western society in the nineteenth century. His early life was in many ways similar to Michael Faraday's: his Humphrey Davy was Thomas Graham and Young's Royal Institution was Anderson's College in Glasgow. Young was Graham's assistant in Glasgow from 1832-37 and moved to London when Graham became Professor of Chemistry at University College. In 1839 Young took up a position at the Muspratt alkali works near Liverpool, which was then followed by employment with Tennant, Crow & Co. in Manchester. During his time in Manchester, Young became interested in the properties and production of various types of products we associate with the petroleum industry. This paper will discuss Young's chemical contributions prior to his work on the production of hydrocarbons and then his work in this area. Finally it will assess the role of Young in the initiation of the American petroleum industry in 1859.

**HIST 7 Napoleon, Berthollet, and the Law of Mass Action**

***Dean F. Martin**, Department of Chemistry, University of South Florida, 4202 E. Fowler Avenue, SCA 400, Tampa, FL 33620, Fax: 813-974-8756, dmartin@cas.usf.edu, and Barbara B. Martin, Department of Chemistry, University of South Florida, Tampa, FL 33620*

Students may well wonder how a fundamental law such as the Law of Mass Action came to be formulated. The answer is an interesting integration of history and chemistry. When Napoleon embarked on his Egyptian Campaign in the late eighteenth century, he was accompanied by a group of French savants, including a trusted advisor, Claude Louis Berthollet. During the course of his assignments in Egypt, Berthollet discovered a unique nitron lake that provided a unique insight and the ultimate development of the Law of Mass Action. Owing to the actions of the British fleet under the leadership of Admiral Nelson, the campaign was a military failure for Napoleon, but it resulted in a success for Chemistry, as well as for Egyptology.

**HIST 8 Chemical history and the Holocaust**
***Erwin Klingsberg**, 4000 Massachusetts Ave NW, Apt 930, Washington, DC 20016, anerwk@juno.com*

Holocaust denial takes different forms that might be termed “active” or “passive.” The former can be seen in streams of lying Middle Eastern propaganda, the latter in the widespread silence cloaking the most frightful Nazi crimes, which made it possible for a chemical corporation that profited handsomely and directly from WW2 death camps to occupy today a respected position as a leader in the global industry, while any mention of its appalling past is avoided by widely read and authoritative periodicals, books and encyclopedias. Know-nothing attitudes likewise turn up regularly in the author's correspondence; if not challenged and exposed, they will more and more deeply corrupt the historical record.

**HIST 9 First annual ACS "Institute of Chemistry" in 1927: Grand experiment in chemical education**
***Roy A. Olofson** and Kristen A. Yarmey, Department of Chemistry, The Pennsylvania State University, 104 Chemistry, University Park, PA 16802, rao3@psu.edu*

In 1927 the ACS created the "Institute of Chemistry," a 3-4 week annual summer conference including short lecture courses, daily conferences on cutting edge subjects, general evening talks, films, and recreational activities. Designed for audiences from the beginning student to prominent researchers along with professional chemists and teachers wishing to keep abreast of new developments, this first "chemist's vacation" was hosted by the Pennsylvania State College in scenic central Pennsylvania. It was directed by Dean George Wendt, assisted by Frank Whitmore of Northwestern University. Other organizers were ACS president George Rosengarten, Harrison Howe, and Neil Gordon. Course lecturers included Jack Drummond (London), Eric Rideal (Cambridge), Hans Tropsch (Germany), and Jean Piccard (Lausanne). E. C. Kendall and Irving Langmuir were among the dozens of major speakers. The immense popular success of this experiment in "plain living and high thinking" led to enormous expectations for the second Institute at Northwestern in 1928.

**HIST 10 History of chemistry resources on the internet**
***Carmen J. Giunta**, Department of Chemistry and Physics, Le Moyne College, 1419 Salt Springs Rd, Syracuse, NY 13214-1399, Fax: 315-445-4540, giunta@lemoyne.edu*

The last time ACS met in Boston, a HIST symposium organized by Harry Pence took a look at history of chemistry sources on the worldwide web. Five years later, the internet has changed a great deal, both in form and content. New digital media include blogs, wikis, podcasts, and video. History of chemistry content on traditional websites and in vast electronic databases of manuscripts, articles, books, and patents has expanded greatly. This presentation is a selective tour of history of chemistry resources on the internet in 2007.

**HIST 11 Illustrations of chemical substances in some earlier Chinese writing**
***Bert Ramsay**, Eastern Michigan University, Department of Chemistry, Ypsilanti, MI 48197, bramsay1@emich.edu*

Modern (Western) chemistry nomenclature was introduced into China by foreign missionaries in the latter half of the nineteenth century. Each Chinese character (in the standard Han script) of an element's name included two “radicals”. The first radical indicated the property of the element in its natural state (metal, gas, “stone”, or liquid). The second radical served as a phonetic aid to how the element name might be pronounced. This talk will present some observations on how chemical substances were represented in some earlier alternative scripts used by two Chinese ethnic groups, the Naxi and Yi people. Of some interest was the pictographic script used by the Dongba priests. This is in contrast to the more abstract ideographic/syllabic characters found in the writings of the Yi people.

**HIST 12 Paul Bartlett's mission: Bringing the message of mechanism to industrial research laboratories**
***Stephen J. Weininger**, Worcester Polytechnic Institute and Massachusetts Institute of Technology, Brookline, MA 02446-6335, stevejw@wpi.edu*

The rise of 20th century mechanistic organic chemistry is conventionally portrayed as solely an academic event, with no attention paid to its application. This picture is a fair representation of how the field developed in the UK, but leaves out important aspects of its US history. Thus, it ignores the industrial consulting and teaching activities of America's pre-eminent physical organic chemist, Paul D. Bartlett. Bartlett consulted for several industrial firms during World War 2, working on problems of immediate military interest. In the postwar period Bartlett expanded his consulting activities, and conducted mini physical organic courses for several consulting clients at their premises. Bartlett energetically promoted mechanistic applications outside as well as within the academy; a number of his students and postdoctoral fellows took industrial positions, of whom many attained managerial positions. This paper will describe Bartlett's "mission" and assess its impact on post-World War 2 research in industrial laboratories.

**HIST 13 Dr. Frankenstein, the lye of blood, and the beginning of chemical synthesis**
***Stephen A. Koch**, Department of Chemistry, State University of New York at Stony Brook, Stony Brook, NY 11794-3400, Fax: 631-632-7960, Stephen.Koch@sunysb.edu*

Wohler's urea synthesis was a four step synthesis starting from dried ox blood. The history of synthetic chemistry will be reviewed from Diesbach and Dippel's synthesis of Prussian blue to Wolher's synthesis of urea. The important role that cyanide chemistry played in 18th and early 19th century synthetic chemistry will be discussed. Some of the interesting individuals involved in this chemistry will also be highlighted.

**HIST 14 Prolegomena to a science of macromolecules**
***Gary D. Patterson**, Department of Chemistry, Carnegie Mellon University, 4400 Fifth Avenue, Pittsburgh, PA 15213, Fax: 412-268-6897, gp9a@andrew.cmu.edu*

The existence and unique properties of macromolecules are currently fully acknowledged. The observations and concepts necessary for the foundation of a science of macromolecules are of fairly recent vintage(1930). The prehistory of the concept of polymers will be presented in this talk. Greek science either viewed matter as a mixture of continuous substances or as indivisible atoms in the void. A natural philosophy of matter that included a concept of attraction was necessary. Newton introduced gravity between all pieces of matter, but the spherical and nonspecific nature of gravity was not enough to generate more than a vague notion of aggregation. Electrical attraction was promoted by Berzelius as the key to the understanding of matter. He even coined the word polymer. But, electrical attraction alone does not yield the specific molecular character of matter. Kekule understood the multivalent character of some atoms and argued for the concept of molecular structure, as did van't Hoff, but they were both skeptical that genuine macromolecules would be stable. Even when objects in solution with high molar masses were demonstrated by many techniques, they were still viewed as aggregates of indeterminate structure. The science of macromolecules needed to wait until the science of molecules advanced to the point where the nature of chemical bonds was better understood. The science of macromolecules is one of the firstborn children of the quantum revolution in chemistry.

**HIST 15 Spectroscopy and the quantum revolution: Old quantum theory gives way to quantum mechanics**
***Kenneth R. Metz**, Department of Chemistry, Boston College, 2609 Beacon Street, Chestnut Hill, MA 02467, Fax: 617-552-2705, kenneth.metz.1@bc.edu*

Most chemists are aware of the dynamic historical interplay between the evolution of spectroscopic theory and the development of quantum theory in the early part of the twentieth century. Beginning with Bohr's 1913 planetary model of the atom, spectra provided the ultimate proving ground for new ideas in quantum theory,

culminating in the matrix / wave mechanics revolution of the mid-1920's. Two pivotal monographs provide snapshots of the state of theoretical development in spectroscopy as old quantum theory evolved into quantum mechanics. The first is Arnold Sommerfeld's 1919 *Atombau und Spektrallinien* (English edition, 1923), a masterful exposition of the modified Bohr model, or old quantum theory, at its zenith. The second is that of Ruark and Urey (*Atoms, Molecules and Quanta*, 1930), which incorporated results from the new wave mechanics and signaled the arrival of an enormously successful era in spectroscopy. This presentation will compare and contrast these treatments.

**HIST 16 Spectroscopy and the periodic table: Tribute to Friedrich Hund's *Linienspektren und periodisches System der Elemente***

***William Barry Jensen**, Department of Chemistry, University of Cincinnati, ML 0172, Cincinnati, OH 45221, wbjensen@email.uc.edu*

Following J. J. Thomson's proposal of his famous "plum pudding" model of the atom in 1904, over two decades would pass, during which numerous chemists and physicists proposed various electronic configurations for the elements, before we arrived at our current s,p,d,f configurations, as first presented by Friedrich Hund in his classic 1927 monograph *Linienspektren und periodisches System der Elemente*. The talk will outline these various proposals as well as the path by which Hund's final configurations made their way into the textbook literature.

**HIST 17 Gerhard Herzberg: Physicist, chemist and astronomer**

***Donald C. Morton**, Herzberg Institute of Astrophysics, National Research Council of Canada, 5071 West Saanich Rd., Victoria, BC V8N 3S9, Canada, Fax: 250 363 0015, don.morton@nrc.gc.ca*

Herzberg began his career studying at the Technische Hochschule in Darmstadt, Germany. Following postdoctoral appointments at Göttingen and Bristol, he returned to Darmstadt. However, life under the Nazi authorities became more and more difficult because his wife, Luise, was Jewish. Consequently, in 1936, he accepted a position at the University of Saskatchewan in Canada. There, with Alex Douglas, he showed that CH+ was the origin of three unidentified interstellar absorption lines. Herzberg also completed both German and English editions of *Atomic Spectra and Atomic Structure* and *Spectra of Diatomic Molecules* with translations by John Spinks. In 1945 he moved to the Yerkes Observatory of the University of Chicago, where he measured the quadrupole lines of H2 in an absorption cell. He returned to Canada in 1948 to the National Research Council in Ottawa. There his research included free radicals, which were mentioned specifically in his 1971 Nobel Prize citation.

**HIST 18 Raising the bar for those who followed: Henry Rowland and the solar spectrum**

***Steven C. Turner**, Division of Medicine and Science, Smithsonian Institution, mrc 627, P.O. Box 37012, Washington, DC 20013-7012, Fax: 202-357-1631, turners@si.edu*

No consideration of twentieth century spectroscopy can be complete without recognizing the contributions of Henry Augustus Rowland. In particular, his *Photographic Map of the Normal Solar Spectrum*, 1888, and *Preliminary Table of Solar Spectrum Wave-Lengths*, 1898, provided the foundations on which future developments in spectroscopy would be built. Like any true landmarks, these works are important on a number of historic levels. In their most obvious role, as laboratory standards, they represented a new level of precision measurement and created a global demand for diffraction gratings made on Rowland's machines. Yet Rowland's successes also inspired efforts to exceed him and pushed American spectroscopy to new levels of precision. Ultimately we can gauge Rowland's importance by the fact that contemporary wavelength tables continue to be called “revisions” or “extensions” of his work.

**HIST 19 A brief history of light scattering spectroscopy**

***Gary D. Patterson**, Department of Chemistry, Carnegie Mellon University, 4400 Fifth Avenue, Pittsburgh, PA 15213, Fax: 412-268-6897, gp9a@andrew.cmu.edu*

One of the most identifiable phenomena in our world is the blue of the sky. The differential light scattering as a function of wavelength was explained by Lord Rayleigh in terms of Maxwell's equations for the interaction of light with polarizable atoms or molecules. The elementary theory predicted perfectly polarized light when the sun was near the horizon and the sky was observed overhead, but actual scattered light from the atmosphere is depolarized. Rayleigh successfully explained this phenomenon in terms of anisotropically polarizable molecules in the atmosphere (nitrogen and oxygen). When monochromatic light is scattered, its color changes due to many effects. The scattering atoms or molecules are moving and the scattered light energy is changed due to energy exchange. The simplest phenomenon is the Doppler Effect due to the translational motion of the scattering particles. The observed light scattering spectrum for a monatomic gas at low pressure reflects the Maxwell-Boltzmann distribution of particles velocities. At higher pressures, the light scattering spectrum is more complicated and reflects cooperative behavior on length scales longer than the mean free path of the particles. This spectrum was predicted by Landau and Plazcek. Light is also scattered by all liquids and solids. Brillouin predicted that thermal sound waves in liquids and solids would scatter light and this effect was eventually observed. Raman predicted that vibrational and rotational motion in molecules would lead to energy exchange during light scattering and received the Nobel Prize for his insight. A fully quantum theory of light scattering was developed by Plazcek and Teller.

**HIST 20 Vibrational and vibration-rotational molecular spectroscopy 1900-1960**

***Alfons Weber**, Optical Technology Division, National Institute of Standards and Technology, 100 Bureau Drive, Gaithersburg, MD 20899, Fax: 301-869-5700, aweber@nist.gov*

The development of vibration and vibration-rotation molecular spectroscopy over the period from 1900 to 1960 will be reviewed. Emphasis will be given to the role played by instrumentation and some of the personalities, as well as books of historical, biographical, and current importance that played a significant role in the development of this field of study. Many of the working ideas that were found to be successful in the era of the old quantum theory were verified or slightly modified by subsequent quantum mechanical insights. These allowed the extension of knowledge accumulated for diatomic molecules to polyatomic systems, especially after the discovery of the Raman effect and the introduction of symmetry arguments in the analysis of observed spectra. The shift from physics to chemistry due the development of “user-friendly” spectrometers and the introduction of the FG-matrix technique for normal coordinate calculations will be addressed. The contributions made by several prominent women spectroscopists will be highlighted.

**HIST 21 Chemistry of the stars: Scheiner & Frost's treatise on astronomical spectroscopy**

***Ronald S. Brashear**, Othmer Library of Chemical History, Chemical Heritage Foundation, 315 Chestnut Street, Philadelphia, PA 19106, Fax: 215-629-5284, rbrashear@chemheritage.org*

Although not technically printed in the twentieth century, Julius Scheiner's *Die spectralanalyse der gestirne* had a tremendous impact on all astrophysicists in the early years of the century. Its importance grew tremendously when Edwin B. Frost translated, revised, and enlarged it four years later as *A treatise on astronomical spectroscopy*. Scheiner's mentor, H. C. Vogel, had considered writing a book to consolidate the prevailing knowledge of astronomical spectroscopy but as his health failed he charged his young assistant to write the first major treatise on the subject. Scheiner's work appeared in 1890 and was an instant success with younger astronomers who were hungry for just such a book. Frost's translation in 1894 spread Scheiner's work to an even larger audience in the United States, where men like George Ellery Hale would make the country the center of observational astrophysics for the first half of the twentieth century.

**HIST 22 Two classics of early American solar spectroscopy**

***Richard L. Kremer**, Department of History, Dartmouth College, 6107 Carson Hall, Department of History, Hanover, NH 03755, Fax: (603) 646-3353, richard.kremer@dartmouth.edu*

Charles A. Young, professor of natural philosophy and astronomy at Dartmouth College from 1866-77, became one of America's first internationally acclaimed astrophysicists by virtue of two classics—an instrument and a book. His multiprism, double-pass spectroscope, built by Alvin Clark & Sons, exposed the technical limit of attempts to increase dispersion by adding prisms, a limit reached just as Rowland's gratings became available. Young's book on the Sun, however, joined a successful trend, published in the International Scientific Series. These wildly popular books began appearing in London in the 1870s; by the 1880s American editions were being printed by D. Appleton & Company in New York. Through these books, authors such as Darwin, Spencer, Tyndall, Lockyer, Wurtz, Marey, etc. popularized the late nineteenth-century sciences ... and Young became known as America's premier solar physicist.

**PRES 6 An impressionistic look at the history of CAS**

***Robert J. Massie**, Director, Chemical Abstracts Service, American Chemical Society, 2540 Olentangy River Road, Columbus, OH 43202-1505, Fax: (614) 447-3713, rmassie@cas.org*

CAS began in 1907 with Chemical Abstracts, produced as a largely volunteer effort for many years. In more recent times, CAS has continued to benefit from a professional staff imbued with the same commitment and dedication exhibited by those hard-working volunteers. CAS' mission to make the world's disclosed chemistry-related information accessible to scientists has entailed many challenges over the years. Two world wars, the post-war information explosion, recurring financial crises, and competitive threats are among the obstacles CAS has weathered. Innovations in indexing, computer-assisted publishing, the creation of the CAS Chemical Registry, creative product development and international cooperation have been crucial elements in CAS' survival and success. Twenty-first century developments, such as new advertising-based business models on the Web and governmental participation in the information industry are no less daunting than the challenges CAS has faced before. A personal view of CAS' history and organizational personality will be presented along with thoughts on its course for the future.

**PRES 7 The CAS database: Back to the future**

***Catharina Maulbecker**, Sales and Marketing, Chemical Abstracts Service, 2540 Olentangy River Road, Columbus, OH 43202, cmaulbecker@cas.org*

To mark the 100th anniversary of CAS, we will be exploring several research topics covered in the first issue of CA to see what scientists were investigating a century ago and how today's scientists might gain new insights from their discoveries. By exploring the old literature, one gains an appreciation of how the exacting, fundamental work performed by chemists in the early part of the 20$^{th}$ century established truths that inform today's research. The older abstracts contain detailed accounts of the experimental processes and their findings. Information, speculation, and interpretation gleaned from these details can provide new facts and perspectives for today's scientists. The more knowledge researchers possess, the better equipped they are to make new connections and to generate new ideas. Reexamining past discoveries in light of today's knowledge sparks innovative breakthroughs by accelerating the process of serendipity. This survey will provide several examples to illustrate the enduring relevance of the early literature of Chemical Abstracts and the electronic resources to which it gave rise.

**PRES 8 The importance of CAS to the world's scientists**

***Hideaki Chihara**, Japan Association of International Chemical Information, Nakai Bldg. 6-25-4, Honkomagome, Bunkyo-ku, Tokyo, Japan, hchihara@jaici.or.jp*

CAS has served the world's scientists and engineers over almost 4 generations. When they begin a new research project, the first thing they do is to look for what is known to mankind about the subject using CAS data in a variety of forms. The importance of CAS' products and services is well recognized and appreciated by the R&D scientists as they know there is no other information source that can provide such an exhaustive search that is provided by CAS. The value of CAS databases stems from their comprehensive coverage in terms of subject area and time frame and from a well-defined index structure and depth of indexing. These elements of the value have not changed in this changing world. During these times, CAS survived the most serious crisis for its existence from late 1960's and early 1970's, when a number of other secondary information journals had to disappear, and it was fortunate for the world's scientists that CAS was able to continue. The importance of CAS today may be expressed by a brief single sentence: No scientist, especially chemical scientist, would think he/she can work without CAS services.

**PRES 9 Chemical Abstracts service: Its role in the history and evolution of scientific information**

***Bonnie Lawlor**, 276 Upper Gulph Rd, Radnor, PA 19087, chescot@aol.com*

The scientific community has been information-centric for centuries. Initially relying upon oral and hand written methods of knowledge distribution, scientists found the advent of the printing press introduced new distribution channels in the form of books, almanacs and newsletters. Soon scientists were awash in information. Then, in 1655 with the publication of the first scholarly journal focused on abstracts of original research, scientists began to rely upon what are known as abstracting and indexing (A&I) services to manage information overload and ensure the broadest possible distribution of published research. Over the past century, Chemical Abstracts Service (CAS) has filled this critical role, expediting the flow of scholarly information in the chemical and related sciences. Since its inception in 1907, it has evolved with changes in technology and user expectations, and has taken a leadership role in the dissemination of scientific information. The author will discuss CAS' role and take a brief look at the challenges and opportunities that it now faces as young, born-digital researchers gradually come to dominate the scientific community.

**PRES 10 SciFinder: It's part of the R&D process**

***Damon Ridley**, School of Chemistry, University of Sydney, Building F11, University of Sydney, New South Wales 2006, Australia, d.ridley@chem.usyd.edu.au*

At times scientists have very specific problems to solve. We may want a particular spectrum, or specific synthetic method, or a key document. At other times we may not know precisely what we want and indeed we are welcome to suggestions, particularly quite novel ones. Historically we achieved this through browsing in the library, or attending lectures outside our immediate fields at conferences. These options are still available to us. Browsing in the electronic library is possible, although here scientists meet several basic problems including the amount of information in the electronic library and the inability to browse many items (e.g. structures, reaction diagrams, information in tables etc). SciFinder offers solutions in two principal ways. The first is through its ability to explore topics, substances, properties, and reactions, both separately and in iterative combinations. The second is through its many post-processing functions, and to achieve this SciFinder critically depends on 100 years of intellectually indexed data. This presentation will present examples on how the functionality in SciFinder allows scientists to browse the electronic literature in a unique and creative way, thereby opening new research opportunities.

**HIST 23 Color: Whether pigment or dye, a delight for the eye**
***Mary Virginia Orna**, Publications Coordinator Office, Journal of Chemical Education, 16 Hemlock Place, New Rochelle, NY 10805, Fax: 914-654-5387, mvorna@cnr.edu*

This paper will trace the use of colorants over the course of several millennia, illustrating how chemistry played a vital role in the development of the modern color palette, either by evolution or revolution. Colorant classification and usage will be discussed, and natural and synthetic colorants will be compared in the context of their historical development.

**HIST 24 Madder on the Monacacy: Eighteenth-century Moravian dye works in Pennsylvania**
***James J. Bohning**, Department of Chemistry, Lehigh University, 6 E. Packer Ave, Bethlehem, PA 18015, Fax: 610-758-6536, jjba@lehigh.edu*

When Moravian missionaries settled in 1741 on the banks of the Monacacy Creek in a town they named Bethlehem, they quickly developed a complex of more than 30 industries that included mills, tanneries and dye houses. Using natural materials such as indigo, madder, logwood and fustic, the Moravians dyed locally made fabrics, especially wool and linen, for almost a century before operations ceased. A 2007 grant from the Commonwealth of Pennsylvania will be used to stabilize the ruins of the original building, which may be the last remaining dye house of its age in the country.

**HIST 25 Messages from dye sample books: Technical, commercial, and cultural**
***Mary Ellen Bowden**, Chemical Heritage Foundation, 315 Chestnut St, Philadelphia, PA 19106, mebowden@chemheritage.org, and Erin McLeary, Roy Eddleman Institute for Education and Interpretation, Chemical Heritage Foundation, Philadelphia, PA 19106*

CHF has more than 50 books and catalogs with swatches of dyed fabric affixed in them. These range from the mid-19th to mid-20th centuries. Many were presented by the American Association of Textile Chemists and Colorists, and others by individual donors. Based on these materials, this talk will examine dye sample books as artifacts in themselves and as bearers of many messages—as Edgar Fahs Smith once wrote of old chemistry texts. Among these are evidences of changes in the technologies of dyestuffs and fibers, in the location of production facilities and means of distribution, and, not least, in matters of fashion and taste.

**HIST 26 Dyeing for a tariff: American politics and German chemicals after World War I**
***Kathryn Steen**, Department of History and Politics, Drexel University, 3141 Chestnut Street, Philadelphia, PA 19104-2875, steen@drexel.edu*

As Anthony Travis knows so well, European firms dominated the production of synthetic dyes in the decades before World War I. Britain lost its initial lead in the new industry, and dyes became closely associated with Germany and the big German firms such as BASF, Bayer, and Hoechst. World War I severed the supply of German dyes, causing dramatic shortages and price increases in the United States. In addition, the wartime hostility towards Germany helped to create a political atmosphere that was very favorable to developing an American industry. The Tariff of 1922 included a most unusual and pioneering set of procedures specifically targeting German dyes, and both the policies and the task of implementing them were particularly daunting technical challenges because of the complexity of German dyes and dyes industry.

**HIST 27 What a wonderful empire is the organic chemistry**
***Anthony S. Travis**, Edelstein Center, Hebrew University/Leo Baeck Institute London, Edmond J Safra Campus, Givat Ram, Jerusalem 91904, Israel, Fax: 972-2-6586709, travis@cc.huji.ac.il*

This paper reviews late nineteenth century perceptions and histories of the synthetic dye industry. The main protagonists are Theodor Herzl, founder of political Zionism; Heinrich Caro, industrial research leader at BASF

of Ludwigshafen; Raphael Meldola, British dye chemist and disciple of Charles Darwin; and Carl Schorlemmer, first British professor of organic chemistry and avowed socialist. Their accounts acknowledge the remarkable and spectacular status that the dye industry once held. While the industry's hold on us as the exemplar of research-based industry is tenacious, its inner workings are little understood. Brushing aside norms of historical accounts of chemical industry and reverting to past visions and seemingly unrelated disciplines and ideologies, this paper ventures different and novel perspectives of the industry.