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Division of the History of Chemistry of the American Chemical Society

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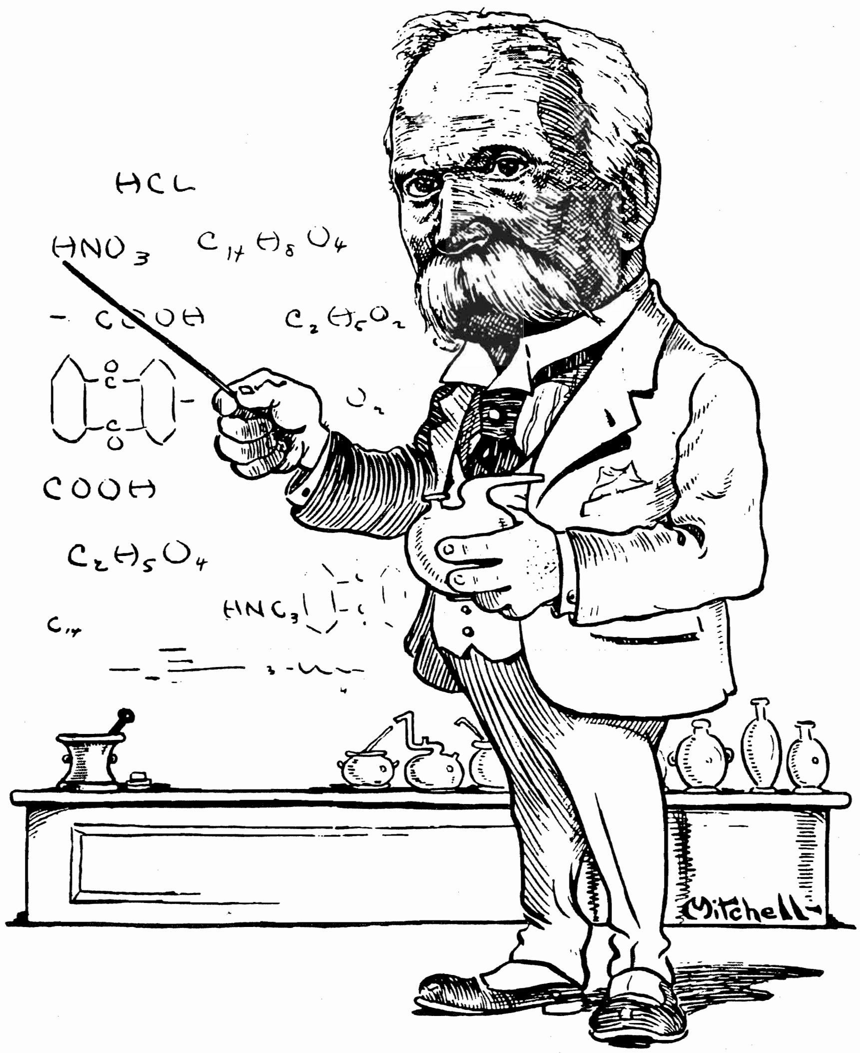


Charles Frederick Chandler
(1836 - 1925)

BULLETIN FOR THE HISTORY OF CHEMISTRY, NO. 2, 1988

Editor .... William B. Jensen
Editorial Assistant .... Kathy Bailey

The BULLETIN FOR THE HISTORY OF CHEMISTRY is published twice a year by the Division of the History of Chemistry of the American Chemical Society and incorporates the Division's Newsletter. All changes of address should be sent to the current Secretary-Treasurer.

CONTENTS

The Cover...

This issue shows a caricature of Charles Frederick Chandler done on his 65th birthday. Chandler was Professor of Chemistry at the Columbia School of Mines from 1864 to 1911 and the founder of a unique chemical museum featured in this issue's CHEMICAL ARTIFACTS column.

DEADLINES

The deadline for the next issue (Spring 1989) is 30 February 1989. All materials should be sent to Dr. William B. Jensen, Department of Chemistry, University of Cincinnati, Cincinnati, OH 45221, Phone: (513) 475-4005.

ACKNOWLEDGMENTS

All illustrations, unless otherwise indicated, are from the Oesper Collection in the History of Chemistry at the University of Cincinnati. Thanks are also due the Department of Chemistry of the University of Cincinnati for providing secretarial assistance.

FROM THE EDITOR'S DESK

On the basis of your response to the first issue of the *Bulletin*, the Executive Committee of HIST will be meeting at the Fall National ACS Meeting in Los Angeles to evaluate the trial issue and to decide on whether (and how) to support the publication in the future. If the vote is favorable, we should have a great deal of news to report next issue, including the selection of an editorial board and an assistant editor, the subscription rate for libraries, the impact on Divisional fees, etc. Until then, we hope you will sit back and enjoy this issue as much as you apparently enjoyed the first.

William B. Jensen, University of Cincinnati

LETTERS

Comments on the First Issue

Your *Bulletin* looks great! I hope a lot of readers remember to tell you this, and perhaps even realize that it is a lot of work to produce. Fun perhaps, too.

Elizabeth A. Moore, Eastern Michigan University

I would like to congratulate you warmly for your effort in producing the *Bulletin for the History of Chemistry* - it has been needed for a long time. The format, the production, and the contents are just right. Keep on with this excellent work.

Fathi Habashi, Laval University

I thoroughly enjoyed the new format for the *Bulletin for the History of Chemistry.* I am an educator who believes the history of chemistry has significant use in the classroom, and the *Bulletin* is easy for students and teachers to read and interpret.

Karen M. Morris, University of Notre Dame

I was very impressed with the *Bulletin for the History of Chemistry* which I picked up at the Toronto ACS meeting. It is a handsome publication which, I feel, uses the techniques of desk-top publishing to great advantage. We here at *CHEMTECH* have passed it around to each other and to our art people as an illustration of something very special. I am looking forward to seeing more copies of the Bulletin and would be happy to tell our readers about it via our Heart Cut column.

Marcia R. Dresner, Senior Editor, CHEMTECH

More on the Grotta del Cane

Dr. William D. Williams of Harding University in Searcy, Arkansas, has sent in a number of additional items relating to the Grotta del Cane. Of particular interest is the description in the 1821 edition of Samuel Parkes' *Chemical Catechism* which points out (p. 250) that the floor of the cave "is lower

Bert Revised

than the door and this hollow is always filled with fixed air, which can rise no higher than the threshold, but flows out like water" and further suggests yet another site "... the Lake of Averno, which Virgil supposed to be the entrance to the infernal regions [and which] evolves so large a quantity of this gas, that birds, flying over it, drop with suffocation." Dr. Williams also points out that the woodcut of the Grotto in Paul Bert's text was revised the next year - the Italian peasant being replaced by a tourist in a bowler hat. In passing, it should be noted that all of the mentioned examples of massive carbon dioxide build-up are connected in some fashion with regions of volcanic activity. The Grotta del Cane is not far from Pompeii and Mount Vesuvius, the site of the famous eruption in Roman times; Java is an island of intense volcanic activity; and Lake Nios is actually a water-filled volcanic crater.

QUESTIONS AND QUERIES

Many of you may remember the controversy a few years ago between Alan Rocke, Bert Ramsay, John Wotiz, and Susanna Rudofsky concerning the reality and function of Kekulé's "dream" accounts in the formulation of the structure of benzene. John Wotiz has scheduled an interesting "Benzol Fest" symposium for the Boston ACS meeting in 1990. I would like to summarize the accounts of where dreams (or daydreams) have played a role in the formulation of scientific (and especially chemical) ideas. I would be interested in receiving any documentation of such accounts. Please contact Dr. O. B. Ramsay, Department of Chemistry, Eastern Michigan University, Ypsilanti, MI 48197, Phone (313) 487-0304.

DIVERSIONS AND DIGRESSIONS

Koerner, Dewar and the Structure of Pyridine

Alan J. Rocke, Case Western Reserve

As Leonard Dobbin remarked half a century ago, there has been much confusion in the literature concerning the discovery of the structure of the most important heterocyclic aromatic compound, pyridine (1). A hitherto unpublished letter throws some additional light on the question, and supports James Dewar's claim to be earlier than the German-Italian chemist Guglielmo Koerner (Wilhelm Körner) in suggesting a formula for pyridine analogous to that of benzene.

The first to *publish* such a structure was clearly Koerner, in April 1869 in an extremely obscure Italian journal, the *Giornale di scienze naturali ed economiche*, published by the Palermo Academy of Sciences. Koerner sent this short article to the Palermo Academy only after the footnote in which the pyridine formula was proposed failed to appear in the original French version, published in the *Comptes rendus* of the Paris Academie des Sciences (2). Some scholars have suggested that the structure must have appeared too speculative to the cautious French editors; it is unlikely that Koerner himself suppressed the passage (3). The structural hypothesis would undoubtedly have remained virtually unknown to northern European chemists, had not Koerner - apparently - sent private communications of the pyridine hexagon concept to a number of colleagues. In the next few years Koerner's structure was mentioned, but without reference to a particular literature citation, by several prominent chemists (4).

In June 1870 James Dewar read a paper before the Royal Society of Edinburgh containing the same hypothesis; it was

James Dewar (1842 - 1923)

Guglielmo Koerner (1839 - 1925)

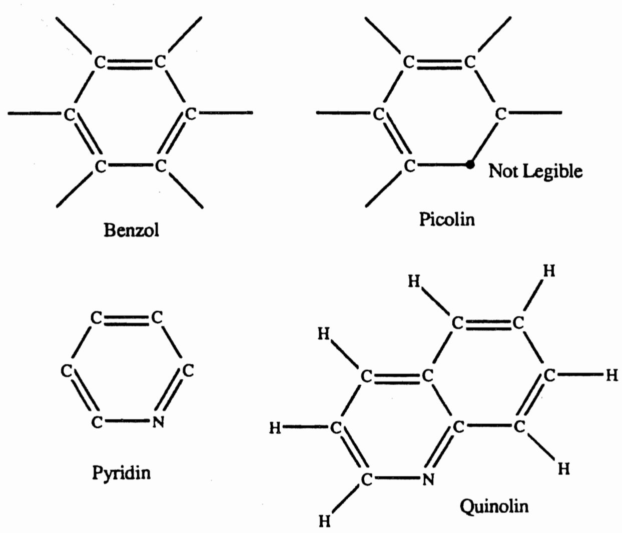
first published in January 1871 (5). He did not cite Koerner's Italian article, even though he had either a reprint or an exact transcript of it in his possession. Dewar's publication became widely disseminated, and for decades afterward it was thought that, while Koerner was the first to privately propose the idea of a pyridine hexagon, Dewar had been the first to publish it (6). A few textbook authors and historians from the 1880's onward, however, discovered Koerner's Italian publication, and gradually the news spread; the last author to assert that Koerner had never published the hypothesis was Edvard Hjelt (7).

But Dobbin showed that the situation is even more interesting: Dewar always believed that Koerner had stolen the discovery from him. Dewar and Koerner had been fellow students in August Kekulé's laboratory in Ghent in the summer of 1867 and were great friends at that time. Dewar later claimed (privately) that he had the concept even before that summer, that he had told both Kekulé and Koerner of his hypothesis, and that he was appalled when he learned of Koerner's publication. He also suggested that the hypothesis could be inferred from the contents of a paper he published in 1868. He never made a public priority claim, partly at least because he still felt friendship toward Koerner (8).

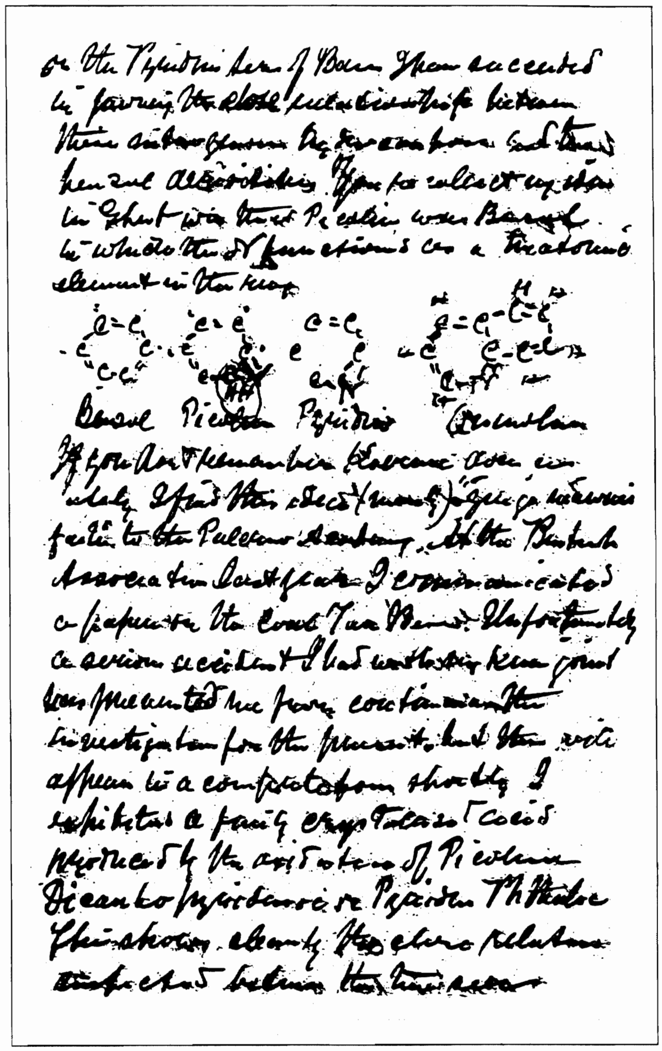
Dewar's assertion that he had revealed his thoughts on pyridine to Kekulé and Koerner is supported by a hitherto unpublished letter from Dewar to Kekulé, dated 1 June 1869, and preserved in the *August Kekulé Sammlung* at the Institut für Organische Chemie of the Technische Hochschule in Darmstadt (9). Dewar wrote, in part:

Since I had the pleasure of working under your superintendence on the Pyridine Series of Bases, I have succeeded in proving the close relationship between these nitrogenous hydrocarbons and the benzol derivatives. You recollect my idea in Ghent was that Picolin was

Benzol in which the N functions as a triatomic element in the ring[:]



If you don't remember [-] Koerner does [-] as lately I find this idea (nearly) "que je m'avais faite" (10) [presented] to the Palermo Academy. At the British Association [annual meeting] last year I communicated a paper on the Coal Tar Bases. Unfortunately a serious accident I had with my knee joint has prevented me from continuing the investigation for the present, but this will appear in a complete form shortly (11). I exhibited a fairly crystallized acid produced by the oxidation of Picoline[:] Dicarbopyridenic or Pyridin Phthalic [acid]. This shows clearly the close relationship suspected between the two series. In the published abstract, I go the length of saying "I believe the bases will be produced by the action of HCN on C_2H_2 at high temperatures" (12). Now if Koerner is so confoundedly sharp in giving us new ideas in *footnotes*, why did he not go a little further and say the Pyridin bases have the same relation to the Quinolin bases as the Benzin has to the Naphthalin series? This is a very small matter but coming from a friend, I don't like it.



The page of Dewar's letter showing the structure of benzene and his proposed structures for picoline, pyridine and quinoline

In short, it seems probable that Dewar did indeed conceive the pyridine structure first, and Koerner may well have imbibed the notion from Dewar, perhaps even without conscious recognition of the processes. Koerner and Dewar had been, according to Dewar's friend Henry Armstrong, a "wild pair" during that summer in Kekulé's lab; they "became associated in all sorts of devilry - Koerner being a great practical joker and Dewar a wild young Scot" (13). It was Koerner, not Dewar, who made a reputation in organic, and particularly aromatic chemistry. Indeed, Koerner became a brilliant theoretician as well as "a laboratory worker of supreme ability," to use Armstrong's words. It was Koerner who first developed, between 1869 and 1874, an absolute method of determining the structures of positional aromatic isomers - a magnificent achievement. Considering Koerner's high character and his close friendship with Dewar, it is difficult to believe that he consciously stole Dewar's ideas. It is also a testament to Dewar's character that, despite having strong suspicions of Koerner's plagiarism, he maintained his friendship and never made a public priority claim. It was this diffidence on the part of both men that partially explains the continuing confusion in the literature on this question.

References and Notes

1. L. Dobbin, "The Story of the Formula for Pyridine," *J. Chem. Educ.*, **1934**, *11*, 596-600.

2. G. Koerner, "Synthese d'une base isomere a la toluidine," *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, **1869** (5 April), *68*, 824; "Synthese d'une base. . ." *Giornale*

di scienze naturali ed economiche, Palermo, **1869** (15 April), *5*, 111-114. Koerner was then working in Stanislao Cannizzaro's laboratory in Palermo. I wish to thank Professor Leonello Paoloni of the University of Palermo for sending me a photocopy of the Italian article.

3. G. Koerner, *Ueber die Bestimmung des chemischen Ortes bei den aromatischen Substanzen*, ed. G. Bruni and B. L. Vanzetti (*Ostwalds Klassiker der exakten Wissenschaften*, No. 174, Leipzig, 1910), p. 131.

4. For example, by A. Baeyer, *Annalen der Chemie*, **1870**, *155*, 282, 321; by C. Schorlemmer, *J. Chem. Soc.*, **1871**, *24*, 145n.; by W. Koenigs, *Ber. Deutsch. Chem. Ges.*, **1879**, *12*, 453; and by Dewar, as early as June 1869 (see letter published here). Several near-contemporary sources assert that Koerner sent "Privatmittheilungen" to friends; see reference 1 for citations.

5. J. Dewar, "On the Oxidation Products of Picoline," *Proc. Roy. Soc. Edinburgh*, **1872** (read on 6 June 1870), *7*, 192-193; ibid., *Trans. Roy. Soc. Edinburgh*, **1872**, *26*, 189-96. Both of these articles were first published in 1872, but a reprint appeared in *Chemical News*, **1871** (27 January), *23*, 38-41.

6. For example, A. Ladenburg, *Ber. Deutsch. Chem. Ges.*, **1883**, *16*, 2063; E. von Meyer, *History of Chemistry*, Macmillan, London, 1891, p. 331; E. Hjelt, *Geschichte der Organischen Chemie*, Vieweg, Brunswick, 1916, pp. 326-27.

7. The first writer actually to cite the Italian journal was G. Schultz, *Chemie des Steinkohlentheers*, 2nd ed., Vol. 1, Vieweg, Brunswick, 1886, pp. 427-28. For other examples, see reference 1.

8. This paragraph summarized in reference 1.

9. I am grateful to Professor K. Hafner for permission to use this collection in May 1975, and for permission to publish this letter.

10. This is Koerner's wording in the critical pyridine footnote; Dewar evidently had received a reprint or detailed communication from Koerner within six weeks after publication of the Italian article.

11. J. Dewar, "On the Coal-Tar Bases," *Rep. Brit. Assoc. Adv. Sci.*, **1868**, *38*, 35-36. The "complete form" is "On the Oxidation Products of Picoline," read to the Edinburgh Royal Society one year after this letter was written.

12. "Dicarbopyridenic" acid is of course pyridinedicarboxylic acid. I cannot see that the hexagonal structure of pyridine is even implied by Dewar's quotation from his 1868 paper.

13. H. E. Armstrong, "James Dewar," *J. Chem. Soc.*, **1928**, *130*, 1066-76, on p. 1069; idem, *James Dewar*, Benn, London, 1924, pp. 6, 17.

Alan J. Rocke is Director of the History of Science and Technology Program at Case Western Reserve University, Cleveland, OH 44106. He is the author of the book "Chemical Atomism in the Nineteenth Century: From Dalton to Cannizzaro" and is particularly interested in the origins of the structural theory of organic chemistry.

OLD CHEMISTRIES

Mystery Editors of Early American Chemistry Texts

William D. Williams, Harding University

American chemistry, like its culture and commerce, was dominated by European influence until the latter half of the 19th century. More than half of the chemistry books published in America prior to 1850 were American editions of European works (1). The most widely used European works included Chaptal's *Elements of Chemistry* (1796 to 1813), Henry's *Epitome of Chemistry* and *Elements of Experimental Chemistry* (1802 to 1831), Marcet's *Conversations on Chemistry* (1806 to 1850), Brande's *Manual of Chemistry* (1821 to 1839), Turner's *Elements of Chemistry* (1830 to 1874) and Fowne's *Manual of Elementary Chemistry* (1845 to 1878). Even so-called "American authored" chemistry books were largely abstracts or mosaics of European works - chiefly British. Indeed, most early American chemical writers described themselves as "compilers" rather than authors.

Before the time of international copyright agreements, American publishers found it cheaper and less risky to reprint a foreign issue than to import it or to use an untried American work. Some of these reprints were unaltered copies, while others had American chemists as editors. The editor was responsible for proofreading and evaluating the text. He added footnotes, appendices, or an American preface or frontispiece. The editor was usually listed on the title page and signed his additions with "Ed" or the initial of his surname.

A few of the earliest 19th century American chemists preferred to keep their editorship anonymous. Three such volumes attributed notes to "an American gentleman", "a professor of chemistry in this country" and "an American professor of chemistry." Another three texts made no mention of an editor, but contained initialed American footnotes or other obvious American additions.

The following describes these six anonymously edited chemistry books and seeks to identify each "mystery chemist" editor.

A New System of Chemistry (1800)

In 1800, a collection of articles pirated from the *Supplement to the Third Edition of the Encyclopaedia Brittanica* was issued by publisher Thomas Dobson in Philadelphia under the title *A New System of Chemistry* ... (2). The title page did not list author, editor, or source, but American footnotes signed "T.P.S." were added to the 197 page section on chemistry. The additional articles (Mineralogy, Animal and Vegetable Substances, and Dyeing Substances) did not contain "T.P.S." footnotes.

The date and initials leave little doubt that this American editor was Thomas Peters Smith (1777-1802), a promising young Philadelphia chemist (3-4). Since Philadelphia was then the center of science in America, it is a testimony to Smith's ability that he was chosen editor when men like James Woodhouse, John Redman Coxe and Robert Hare were locally available. As a member of the Chemical Society of Philadelphia, Smith had already distinguished himself with work on committees of the society and by presenting the annual address in 1798. This address, *A Sketch of the Revolutions in Chemistry*, is the earliest known publication of an American chemical society (5). From May 1800 to August 1802, Smith toured Europe, visiting scientists and observing industrial methods. On the voyage home, he was killed at the untimely age of 25 by an explosion of the ship's cannon. American chemistry and technology suffered the loss of a tremendous potential.

The editing of *A New System* was one of Smith's last projects before he left for Europe. The sailing date probably caused him to be rushed in the task, because the first footnote states (6):

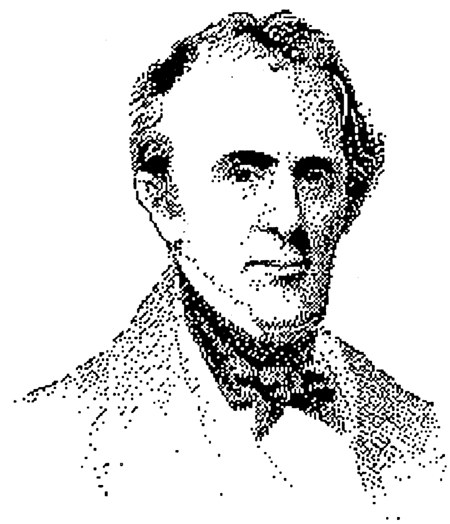
> The writer of the notes signed by T.P.S. considers himself responsible for no other errors contained in this system of chemistry than those contained in his own notes. From a number of circumstances, he was under the necessity of reading this work so cursorily, that probably many deductions which on more mature considerations he might have objected to, may have passed unnoticed.

The unnamed British author of the original *Encyclopaedia Brittanica* article presents another "mystery chemist". He was identified in the second American edition of *A New System of Chemistry* in 1803. It contained identical contents and pagination (including the notes by T.P.S.), but this time the title page included "By Thomas Thomson" (7). Another brilliant youth, Thomson had become editor of the supplement of the *Encyclopaedia* while attending medical school at Edinburgh. The article on chemistry was the preliminary experience for his four-volume treatise, *A System of Chemistry*, published in Edinburgh in 1802. A comparison of the shorter *Encyclopaedia* article with the later large work reveals many identical passages.

At the time Thomas P. Smith edited the *Encyclopaedia* article, Thomson was not yet an established authority and it is doubtful that Smith knew whom he was editing. At any rate, Smith did not hesitate to disagree with the author, insert his own definitions, or make alternative explanations. At the age of 23, Smith exhibited considerable chemical self-confidence.

Epitome of Chemistry (1808)

The 1808 edition of William Henry's *Epitome of Chemistry* had "notes by a professor of chemistry in this country" (8). The British text was unaltered and a 20-page American appendix of notes was added. This "professor of chemistry" is readily identified by comparing the 1810 edition of the same work.



Benjamin Silliman (1779 - 1864) the anonymous editor of several American editions of early 19th century British chemistry texts.

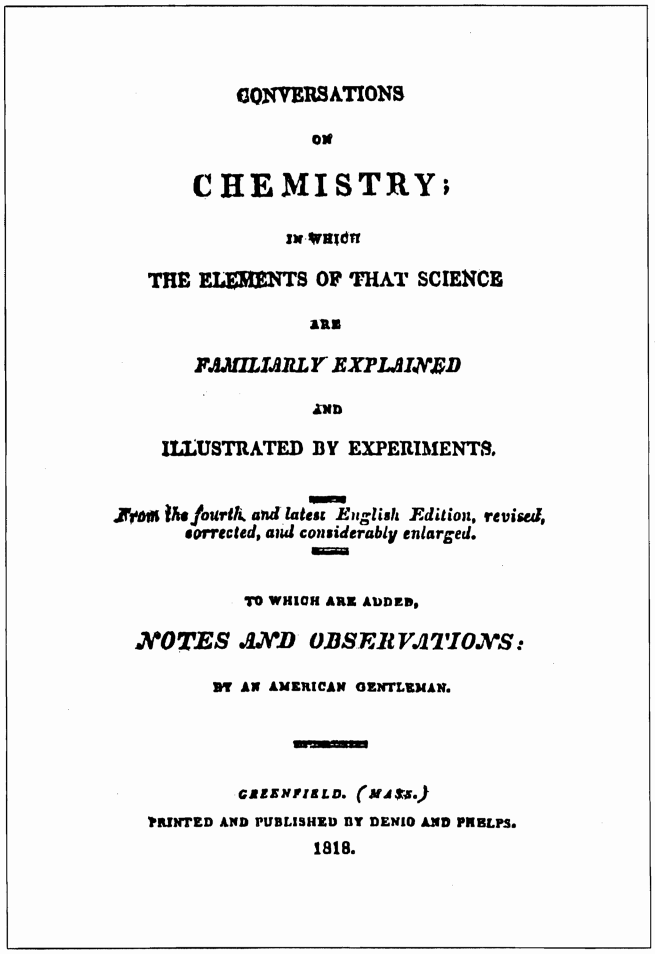
The latter contained the same notes as the earlier, but in this edition, the title page listed the editor as "Benjamin Silliman, professor of chemistry at Yale College" (9).

Benjamin Silliman, Sr. (1779-1864) taught chemistry at Yale from 1804 to 1853. He used Henry as a text until 1830, when he bought out his own two volume *Elements of Chemistry*. Silliman enjoyed a wide reputation as a public lecturer and as founder and editor of *The American Journal of Science and Arts*. There were clues in the 1808 edition that would have identified Silliman as the editor, even without the 1810 edition. A note on "Gazometer and Air-Holders" ends with a mention of "Mr. Hare's compound blowpipe ... which was suggested to the writer while in Philadelphia ..." The association of Silliman and Hare, while they studied chemistry under James Woodhouse at the University of Pennsylvania, is well documented.

Some references, including one by Benjamin Silliman, Jr., regard John Maclean as "associated with ... Prof. Silliman in editing the first American edition of Henry's Chemistry in 1808" (10). This appears, however, to be an incorrect conclusion from a letter of recommendation in that volume. This letter, signed by both Maclean and Silliman, stated that "we have adopted it (Henry's *Epitome*) for our respective classes," but goes on to specify, "A revised and corrected edition has, at the request of one* of us, been printed ..." The footnote stated: "*B. Silliman" (11). In his autobiographical reminiscences, the senior Silliman wrote of the 1808 "republication of Henry's chemistry with my additions" (12).

Conversations on Chemistry (1809)

The 1809, the 1813 and the 1814 editions of Jane Marcet's *"Conversations on Chemistry*, did not list an American editor,



CONVERSATIONS

ON

CHEMISTRY;

IN WHICH

THE ELEMENTS OF THAT SCIENCE

ARE

FAMILIARLY EXPLAINED

AND

ILLUSTRATED BY EXPERIMENTS.

From the fourth and latest English Edition, revised, corrected, and considerably enlarged.

TO WHICH ARE ADDED,

NOTES AND OBSERVATIONS:

BY AN AMERICAN GENTLEMAN.

GREENFIELD. (MASS.)

PRINTED AND PUBLISHED BY DENIO AND PHELPS.

1818.

The 1818 American edition of Marcet's *Conversations on Chemistry* with "Notes and Observations by an American Gentleman"

but had a frontispiece engraving of the "Pneumatic Cistern of Yale College" and appendices giving "a description of the pneumatic cistern" and "the manufacture of artificial mineral waters in the United States" (13). The British contents were unaltered.

These volumes were apparently also edited by Benjamin Silliman, Sr. Publication in New Haven and the mention of Yale would suggest Silliman. The frontispiece drawing and the appendix description of the pneumatic cistern of Yale College were the same as those in the 1810 edition of Henry's *Epitome of Experimental Chemistry*, which did list Silliman as its editor. The last line of the appendix description of the pneumatic cistern at Yale ended with: "... executed by the writer, B. Silliman" (14).

Silliman was involved in a commercial venture to market artificial mineral waters. This enterprise must have been the incentive for the three-page, state-of-the-art appendix in *Conversations*. (A similar appendix on artificial mineral water was also in the 1810, Silliman edited, Henry's *Epitome*.) The appendix in the 1809 and 1813 *Conversations* concluded: "The manufacture of mineral waters upon correct chemical principles was undertaken in New Haven [1806] ... and ... a public establishment for this purpose was opened under the direction of Professor Silliman. An establishment of the same kind, and under the same direction, was effected in New York in 1809 ..." (15).

Conversations on Chemistry (1818)

In the 1818 and 1820 editions of Marcet's *Conversations on Chemistry*, notes and observations were added "by an American gentleman" (16). The only alterations of the British text were three brief notes in an appendix.

The library catalog card for the 1818 edition in the Edgar F. Smith Memorial Collection has the notation: "additions by J. L. Comstock" (17). A librarian's comment on the Library of Congress card for this work and on the title page of the volume in the Boston Public Library also attribute the work to John L. Comstock.

Eleven editions of *Conversations* from 1822 to 1850 did indeed have Comstock's name printed as editor on the title page. Evidence, however, does not support the conclusion that he also edited the 1818 and 1820 editions. A comparison of the anonymous notes in the 1818 edition, with those known to be Comstock's in the 1822 edition, shows no similarity whatsoever. The 1818 edition had only three brief, rather elementary notes by the American editor in an appendix. Comstock's 1822 edition, however, had voluminous footnotes containing sophisticated additions, corrections, and explanations. Comstock exhibited a chemical knowledge and experience far beyond that of the 1818 editor (18).

Another early chemistry writer, John Ruggles Cotting, taught about this time in an academy in Greenfield, Massachusetts, where the 1818 and 1820 *Conversations* were published. A comparison of the *Conversations* appendix notes with Cotting's 1822 text, *An Introduction to Chemistry*, shows no similarity, however (19), and the identity of the "American gentleman" remains a mystery.

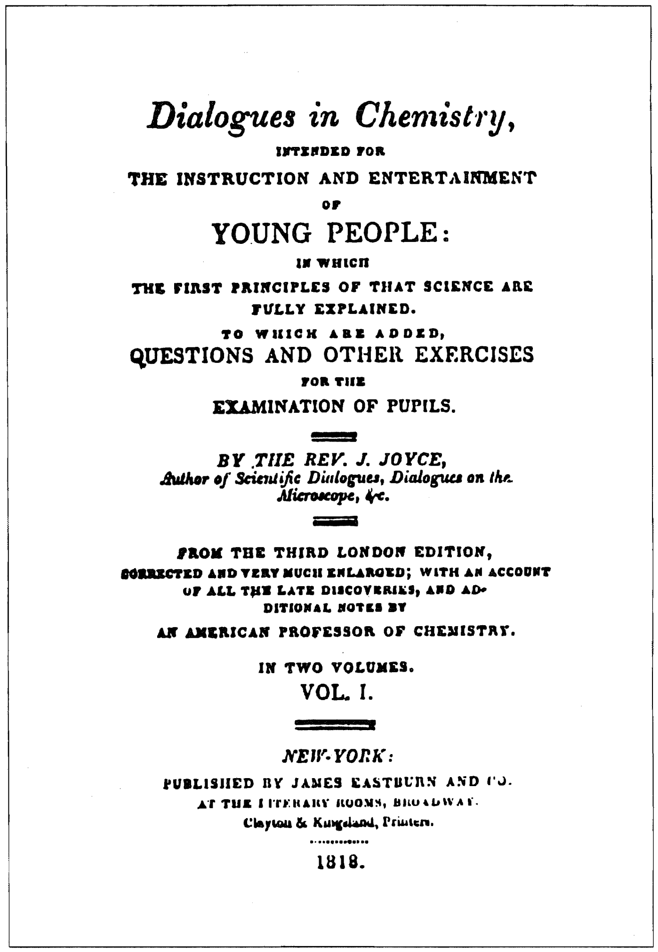
Conversations on Chemistry was a popular elementary chemistry text in the format of a classroom discussion between a lady teacher and two girl students. Published anonymously for almost 30 years in England and America, it eventually bore the author's name, Mrs. Jane Haldimand Marcet. The wife of a London physician and chemist, she also authored other children's books. Michael Faraday credited Marcet's *Conversations* with influencing his scientific career (20). Marcet attended the lectures of Sir Humphry Davy and was quick to add his new ideas to her text - a practice that was sometimes criticized by her American editors. The book enjoyed wide circulation in America and had at least seven different American editors from 1806 to 1850. In addition to the "American gentleman," Comstock and Silliman, other editors were William H. Keating, Joseph Cloud, Thomas Cooper, and Thomas P. Jones.

A Chemical Catechism (1821)

The 1821 edition of Samuel Parkes' *Chemical Catechism* did not list an American editor, but several footnotes were inserted in brackets and initialed "G" (21). These bracketed notes were not present in 1816 and 1818 editions. They are concluded to be American because the obvious British notes are not bracketed and because one of the bracketed notes boasted of Robert Hare as the inventor of the oxygen-hydrogen compound blowpipe. Such a comment was common in American chemistry books of that era because European scientists had failed to give Hare credit for the invention.

The only prominent American chemists active in 1821 with surnames beginning with "G" were John Gorham, who taught chemistry at Harvard; Jacob Green, who taught at Princeton; and John Griscom, who taught at Rutgers Medical School and Monitorial High School in New York City and gave public lectures in chemistry. Of these three, John Griscom is the most likely editor. Gorham was too busy with a medical practice and his own two-volume text, *The Elements of Chemical Science*, brought out in 1819-20. Although Green did publish anonymous works on chemistry and electricity, he had just begun his chemical career in 1818. Griscom was not only well experienced with secondary level science, for which the

Jane Marcet (1769 - 1858), whose extremely popular book *Conversations on Chemistry* was published for nearly 30 years without her name on the title page. Authorship of the book was frequently attributed to her many American editors and even at times to Mrs. Bryant, the fictional teacher who leads the conversations in the book.



Dialogues in Chemistry,
INTENDED FOR
THE INSTRUCTION AND ENTERTAINMENT
OF
YOUNG PEOPLE:
IN WHICH
THE FIRST PRINCIPLES OF THAT SCIENCE ARE
FULLY EXPLAINED.
TO WHICH ARE ADDED,
QUESTIONS AND OTHER EXERCISES
FOR THE
EXAMINATION OF PUPILS.

BY THE REV. J. JOYCE,
Author of Scientific Dialogues, Dialogues on the Microscope, &c.

FROM THE THIRD LONDON EDITION,
CORRECTED AND VERY MUCH ENLARGED; WITH AN ACCOUNT
OF ALL THE LATE DISCOVERIES, AND ADDITIONAL NOTES BY
AN AMERICAN PROFESSOR OF CHEMISTRY.

IN TWO VOLUMES.
VOL. I.

NEW-YORK:
PUBLISHED BY JAMES EASTBURN AND CO.
AT THE LITERARY ROOMS, BROADWAY.
Clayton & Kingsland, Printers.
1818.

The 1818 American edition of Joyce's *Dialogues in Chemistry* with "Additional Notes by an American Professor of Chemistry"

Catechism was designed, but also lived in New York where it was published. No confirmation of Griscom serving as editor has been found.

Dialogues in Chemistry (1818)

Dialogues in Chemistry by Jerimiah Joyce was a small two volume British text for juveniles. The format was similar to Marcet's *Conversations on Chemistry* except that the discussion took place between a male tutor and two boy students. The science content of *Dialogues* was more elementary than that of *Conversations.* The single American edition contained "additional notes by an American Professor of Chemistry" (22). The only alteration from the British edition was eight pages of brief notes in appendices at the end of the two volumes.

Editorship of this American edition is not definite, but it may also have been the work of Benjamin Silliman, Sr. The phrase "American Professor of Chemistry" is very similar to

"A professor of chemistry in this country" that Silliman used in his 1808 edition of Henry's *Epitome* discussed above. A comparison of the notes of *Dialogues* with those in *Epitome* does not reveal any identical passages, but each work located notes in an appendix and each exhibited a similar third person writing style. Although different topics are considered in the two sets of notes, several similar topics and wordings can be found. Silliman made a very personal comment about the preparation of nitrous oxide in his 1810 *Epitome*: "If the gas be skillfully prepared, the precaution of letting it stand several hours over water seems to be unnecessary... The writer has not hesitated to administer it for respiration within half an hour ..." (23). A shorter note about this same topic in *Dialogues* reads: "If proper care be taken in preparing this gas, it need not stand so long over water. It may be used with safety in one hour" (24). Several other notes give similar advice without using identical wording.

No mention of an editorship of *Dialogues* can be found in biographies of Silliman, but neither did he acknowledge the editorship of *Conversations*. Perhaps Silliman did not want his name associated with such elementary chemistry.

If Silliman wasn't the editor, the list of American professors of chemistry in 1818 would not be large: John Gorham at Harvard; Parker Cleaveland at Bowdin; Thomas Cooper and Robert Hare in Philadelphia; James F. Dana at Dartmouth; John Griscom in New York; Thomas P. Jones at William and Mary. A study of the writings and biographies of these men fails to give any hint of the editorship of *Dialogues*.

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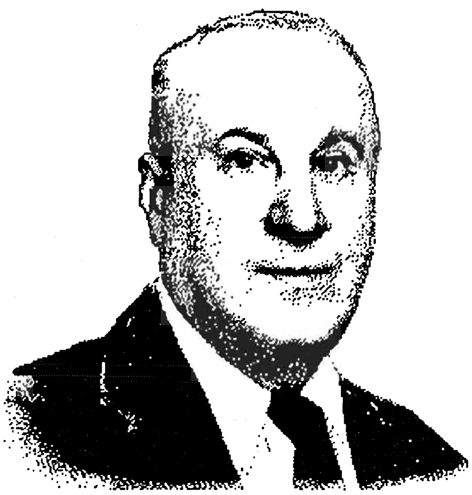
William D. Williams is Professor of Chemistry at Harding University, Searcy, AR 72143. He collects and studies early American chemistry texts. The author would welcome additional clues or confirmations in these literary detective cases.

THE HISTORY OF THE DEXTER AWARD

Part II: The First Decade

Aaron J. Ihde, University of Wisconsin

Ralph Edward Oesper (1886-1977), professor of analytical chemistry at the University of Cincinnati, received the first Dexter Award in 1956 for his career-long contributions to the history of chemistry. He translated many historical works for American publication and wrote numerous short biographies of chemists, ranging from the most distinguished to some who were truly obscure. He also taught a course in history of chemistry and gave many public and private lectures on the subject. In 1975 he published *The Human Side of Scientists*, a book of anecdotes about chemists which reflected his deep interest in people. During his many trips to Europe, he visited working chemists and collected books and pictures for a collection which has been given to the University of Cincinnati, where he also endowed a faculty position in the history of chemistry and chemical education. He died at the age of 91, remaining active in the field until the end.



Ralph E. Oesper

Williams Haynes

The 1957 award to Williams Haynes (1886-1970) was primarily for his six-volume history of the American chemical industry. Haynes was an authority on chemical industry and chemical economics who, for many years, was publisher of several technical magazines. He was also the author of a series of popular works on industrial chemists and the chemical industry.

Eva Vivian Armstrong (1877-1962) received the award in 1958. She was not college educated, but in 1911 began working as secretary to Edgar Fahs Smith, Chairman of the Chemistry Department at the University of Pennsylvania and Vice-Provost of the University. She continued as Smith's personal secretary when he retired in order to assist in cataloging and organizing his very extensive collection of books, pictures, letters, manuscripts, medals and other memorabilia. Following his death, she became secretary and curator of the Collection, which Mrs. Smith donated to the University of Pennsylvania. She served in this capacity until 1949. By this time she had played a role in bringing into reality an annual publication, *Chymia*, as a vehicle for publication of work in history of chemistry. She served as secretary of the Board of Editors until 1953. During her period as curator, she published 20 papers dealing with the Collection and also with the lives of important chemists, using material from the Collection.

Eva V. Armstrong

John Read

John Read (1884-1963), winner of the award in 1959, was born in southwest England and educated in London and Zurich, where he took his doctorate under Alfred Werner. He taught briefly in London and Australia before taking his permanent position at the University of St. Andrews in Scotland. At St. Andrews, his humanistic leanings were fortified by finding a book collection rich in works on alchemy and early chemistry. This led to his writing *Prelude to Chemistry*, which was published in 1935 and proved to be a popular treatise which explained alchemy in relation to its scientific, artistic and literary setting. Read pursued stereo-chemical research until his retirement and left a major impact with his many books ranging from organic chemistry texts to historical treatises.

Denis I. Duveen

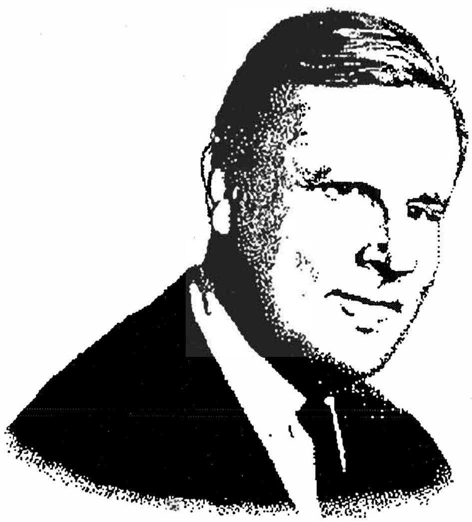
The first four recipients of the Dexter Award were over 70 years of age. Denis Ian Duveen (b. 1910), the fifth awardee, broke that pattern in 1960 at age 50. Born in London, a relative of Duveen, the art dealer, Denis was educated at Oxford with additional studies in Paris and London. During World War II, he did chemical work in ordnance. When the war ended, he became chemist with Ashe Laboratories but, by the end of the forties, had determined to emigrate to the U.S. and establish a soap corporation near New York City. Even while in college he had begun collecting books on alchemy and early chemistry. This collecting continued even during the war years and by the late forties he had brought together more than 3,000 volumes. He prepared a bibliography, *Bibliotheca Alchemica et Chemica*, which was published in 1949. He placed his collection with the New

James R. Partington

York book dealer, Kraus, for sale. It was purchased by the University of Wisconsin in 1950. By this time, Duveen had decided that collecting in the whole field of chemistry was an unsound practice and he decided to specialize in the chemistry of Lavoisier and his period. The books in his collection pertaining to this subject were not included in the Wisconsin sale. He continued collecting Lavoisier material and ultimately published a bibliography of the works of Lavoisier and his contemporaries. This collection was put up for sale about 1960 and was purchased by Cornell University. Duveen's contributions, while strongly focused on collecting and bibliographic matters, included numerous papers prepared from holdings in his collection.

The Dexter Award went to James Riddick Partington (1886-1965) of Queen Mary College, University of London, in 1961. Partington was educated in Manchester and Berlin, where he studied specific heats of gases under Nernst. He engaged in wartime research during World War I and then became a faculty member of Queen Mary College. He is well-known for his numerous papers and books on physical and inorganic chemistry, and on history of chemistry. At the time he received the award, he was publishing his projected four-volume history of chemistry, a definitive text which, because of his death in 1965, was not brought fully to completion. Part II of Volume I remains forever incomplete.

Henry Marshall Leicester (b. 1906), winner of the 1962 award, became an active participant in the history of chemistry in the 1940's. Born in San Francisco, educated in Stanford through a Ph.D. in organic chemistry, he found himself a victim of the Depression of the thirties when he moved through a sequence of jobs. While a research associate at Ohio State



Henry M. Leicester

University, he found a full collection of the *Journal of the Russian Physico-Chemical Society*. While reading the journal, he became interested in the lives and contributions of Russian chemists and was soon deeply involved in the history of chemistry. Finally obtaining a permanent position as Professor of Biochemistry in the College of Physicians and Surgeons-San Francisco, he combined research in dental biochemistry with research in history of chemistry. He contributed two source books, a history of chemistry, a history of biochemistry, and a translation of Lomonosov's publications on corpuscular theory. Leicester became active in the History of Chemistry Division in the forties, serving as Chairman of the Division for several years, and becoming editor of *Chymia* following the death of Tenny L. Davis in 1949.

Douglas McKie (1896-1967), winner of the 1963 award, was born in England, the son of a Scottish soldier, whose military career he planned to emulate. While serving on the western front during World War I, McKie was so seriously injured that his military career was permanently ended. He

Douglas McKie

studied chemistry at University College, London, and became a junior faculty member in Chemistry and in the recently created Department of History and Philosophy of Science headed by Abraham Wolf. McKie published a biography of Lavoisier in 1934 and continued to study the career of that chemical pioneer the rest of his life. He was also a student of Joseph Black. McKie contributed numerous books and papers on various aspects of the history of chemistry and founded the journal, *Annals of Science*.

The winner of the 1964 award, Eduard Farber (1892-1969), was born in Galicia, then Austria-Hungary, now a part

Eduard Farber

of the Ukraine. His father was a Leipzig businessman who expected his son to follow in his footsteps. Farber had an intellectual leaning which resulted in early rebellion and his father finally permitted him to attend the University of Leipzig. After completing his doctorate, he worked with Carl Neuberg at the Kaiser Wilhelm Institute in Berlin. Because of weak eyes, he was not obliged to serve in the German army, but was forced to leave the Institute and supervise the conversion of a fermentation plant to production of nitroglycerine. After the war, he became Director of Chemical Research with Holzyhydrolyse A.G. in Mannheim. Farber fled Germany in 1938, coming to the U.S., where he served as a chemical consultant and a laboratory director. In 1943, he became director of chemical research for Timber Engineering, a firm in Washington, D.C. Farber developed an early interest in history of chemistry and published a German text in the field in 1921. He continued to pursue this avocation throughout the remainder of his life, publishing numerous papers and several books, including a second history of chemistry, this one in English. His principal contribution was the editing of *Great Chemists*, a collection of biographies, partly selected from existing literature and partly written by selected contributors.

Martin Levey

Martin Levey (1913-1970), recipient of the 1965 award, was born in Philadelphia and combined the study of chemistry and languages. He served in the Merchant Marine during World War II, then took an industrial position until he entered Dropsie College in 1949 to pursue the study of Semitic languages and the history of ancient and medieval science. Despite a doctorate in history of science, he found great difficulty in finding an academic position which permitted him to pursue his talents. He ultimately obtained an appointment at SUNY in Albany, with an opportunity to create a department such as he desired. Levey published a treatise on Babylonian chemistry and technology in 1959 and up to the time of his unfortunate death in 1970 published nearly a dozen additional works, most of them translations from Middle Eastern Antiquity and the Middle Ages, dealing with mathematics, book production, perfumery, toxicology, medicine and chemistry. He had a great talent for combining archeology, exotic languages, and science.

The overall statistics for the first decade of the award reflect its diversity, in terms of both the recipients themselves and the nature of their contributions. Of the first ten recipients, five were in their seventies when they received the award, two were in their sixties, and three in their fifties. All but one (Armstrong) were formally trained as chemists at either the undergraduate or graduate level. Four held academic positions in chemistry, two were industrial chemists, two held academic positions in the history of science, one was a librarian, and one was an editor. Their contributions ranged from the writing of general histories of chemistry to the writing of biographies, the founding and editing of journals, and the assembling and maintenance of major library collections in the field.

Part III of the series, dealing with the second decade of the award, will appear in the next issue.

Dr. Aaron Ihde is Professor Emeritus in the Department of Chemistry of the University of Wisconsin, Madison, WI 53706. A Past-Chair of the Division (1962-1964) and a winner of the Dexter Award (1968) himself, Dr. Ihde is perhaps best known for his classic text "The Development of Modern Chemistry", which has recently been reissued as a Dover paperback.

BONES AND STONES

The 250th Anniversary of the Saint Maurice Ironworks

Fathi Habashi, Laval University

On 20 August 1738, Pierre-Francois Olivier de Vezin, an iron master from France, who had come especially to New France in 1735 to operate the Forges de Saint-Maurice near Trois-Rivieres, Quebec, started the first successful iron making furnace in Canada. This event will be celebrated in Canada by a silver dollar that will be issued by the royal Mint in Ottawa in the summer of 1988.

The design of the dollar (see figure) will show a typical eighteenth century scene depicting two smiths with hammers raised, striking iron on an anvil. The base of the anvil will carry the date 1738 and the anvil itself will be adorned with a "fleur de lys", the emblem of the Province of Quebec. The name of the factory "Les Forges du Saint-Maurice" will be marked in French and English on one side while the other will carry the effigy of Queen Elizabeth II. The scene is designed by the Canadian artist Robert-Ralph Carmichael of Ontario. The dollar will contain 50% silver, 50% copper, weigh 23.33 grams and measure 36.07 millimeters in diameter. The number of pieces minted will be limited to the orders received before 30 November 1988.

Canada's first ironworks is located half-way between Quebec City and Montreal on the Saint-Maurice River, which is connected to the Saint-Lawrence River at the town of Trois-Rivieres. It operated from 1738 to 1883 and was shut down because it did not adopt the essential technological change of replacing charcoal with coke in the blast furnace. The present Canadian iron and steel industry was later established in Nova Scotia and Ontario near coal deposits and the Saint-Maurice Ironworks is now an historic site.

The first attempt at iron production in Saint Maurice was in fact in 1733 and was based on American rather than French technology. The first owner of the Works, Francois Poulin de Francheville, sent three smiths to New England to collect information for building a forge. It is not known where these workers went, but most probably they went to Massachusetts, where an iron working industry existed. The forge produced two thousand pounds of wrought iron bars in 1734, but the furnace collapsed and was demolished either in 1734 or in 1735. The owner of the Works had already died at the end of 1733 and was survived by his widow, who unsuccessfully tried to operate the company.

The failure of the first attempt was not due to bad American technology - New England at that time had a relatively well established iron industry - but rather to the limited amount of funds available to Francheville, which forced him to choose the construction of a short furnace fueled by charcoal into which air was blown by small bellows. The temperature of combustion was not enough to melt the iron produced. Thus a product called "bloom", which was wrought iron mixed with slag, was obtained. This was removed from the furnace, then hammered while hot in order to squeeze away the slag and obtain a nearly carbon-free iron. This wrought iron was malleable and could be shaped into different forms.

When a new company was organized in 1736, more funds were made available by the French monarch as a subsidy and a more modern process was used. A taller furnace was constructed and larger bellows were used so that the temperature in the furnace was hot enough to obtain a molten product. Due to the high temperature, carbon dissolved in the iron and a product containing 2-4% C was obtained, known as cast iron. This product could be easily cast but was brittle. To obtain a malleable product, the cast iron must be melted again in an air stream in a small furnace called a finery to oxidize its carbon content. Most of the product, however, was used as cast iron. In 1741, the company went bankrupt and, as the King of France was the only financial backer, the Forges became the property of the crown. Despite the bankruptcy, the industry continued to produce. War with England was a constant threat and so, for the next 20 years, production was concentrated on military equipment, such as cannon and cannonballs.

After the conquest of New France in 1760, the British realized the importance of the Forges. For the first few years of British rule, it was a government-run business. In 1767, however, it passed into the hands of private companies until it was shut down for good in 11 March 1883.

The Industrial Revolution started in England in 1709 when coke replaced charcoal for the first time in a blast furnace. In France this took place in 1782 and in Canada about 1910. In the United States the situation was different because of the presence of important anthracite deposits. Anthracite is very similar to coke and it started to replace charcoal in the 1840's. It was also about this time that coke production in United States was mastered and its use in blast furnaces was introduced. The importance of switching from charcoal (made from timber) to coke (made from coal) is due to the fact that coke is porous and more mechanically resilient than charcoal. Hence, it could be charged into tall furnaces without crumbling into powder. This, in turn, resulted in increased productivity and decreased costs.

In 1973 the Government of Quebec transferred administration of the site to the Federal Government so that it could be developed as a national historic park. Immediately thereafter, archeologists excavated the deserted region. The artifacts they unearthed were cleaned and prepared for use in interpreting the history of the Forges. A blast furnace model (complete with water wheel and air bellows operated by a water current) has now been constructed to explain to visitors how iron was produced a hundred years ago, when the daily output of the Forges was three to four tons.

The park Forges du Saint-Maurice is an intriguing spot for visits by laymen and professionals alike. A tour includes interpretations by well-informed guides as well as a Swedish documentary film dealing with a small blast furnace shut down at the beginning of this century.

Dr. Fathi Habashi is Professor of Extractive Metallurgy at Laval University, Quebec City, Canada, G1K 7P4 and has written numerous articles on the history of industrial chemistry.

WHATEVER HAPPENED TO THE MICROCRITH?

William Jensen, University of Cincinnati

Until quite recently, authors of introductory chemistry texts have always been careful to point out that atomic weights are relative rather than absolute and that they consequently have no units. However, the use of the words relative and absolute in this context is in some ways unfortunate. The intent was, presumably, to point out that, although the masses of atoms could be determined relative to one another by arbitrarily selecting a particular atom as a standard, their values in grams or in other conventional mass units was unknown or, at best, only approximate. The problem, of course, is that *all* conventional mass scales are in reality relative and involve comparison with an arbitrarily selected standard whose use depends on the twin virtues of reproducibility and convenient size. Thus, in practice, the only thing which distinguished the so-called relative atomic mass scale from the conventional metric scale was a failure to give the former unit an explicit name, and the so-called dichotomy of relative versus absolute resolves itself into one of determining an accurate conversion factor between the two units.

It was apparently not until 1961 and the adoption of the ^{12}C = 12 scale and the unified atomic mass unit (u) that chemists came to accept this point of view - apparently - because, in fact, a little-known atomic mass unit called the *microcrith* had actually been introduced into chemistry 90 years earlier and had enjoyed a brief, but limited, existence in American high school chemistry texts during the last quarter of the 19th century. The origins of this unit can, in turn, be traced back to an earlier unit called the *crith*, which was introduced into chemistry by the German chemist, August Wilhelm Hofmann (1818-1892), in the 1860's.

Though German-born and educated, Hofmann spent nearly two decades (1845-1864) as Professor of Chemistry at the Royal College of Chemistry in London. When he finally returned to Germany in 1865 to accept a position at the University of Berlin, his former students at the Royal College requested that he issue his famous course of lectures at the College in book form. Hofmann complied - at least in part. Deleting the later descriptive lectures, he published the first 12 introductory lectures, dealing with the theory of chemistry, in 1865 as a small volume entitled *Introduction to Modern Chemistry: Experimental and Theoretic* (2). This was quickly translated into German and, in this form, went through many subsequent editions and revisions (3).

August Wilhelm Hofmann

As the word "modern" in the title suggests, Hofmann felt that chemistry had recently undergone a significant transformation, the most important components of which were the consistent and widespread use of Avogadro's hypothesis and gas densities to arrive at a self-consistent set of atomic and molecular weights and the emergence of the concept of valence. Indeed, it was in this very volume that Hofmann introduced the word valence into the chemical lexicon in the form of its longer variant - quantivalence (4).

The primacy of gas densities in the development of a self-consistent theory of chemical composition was emphasized by Hofmann throughout the book. Beginning with the volumetric decomposition and synthesis of the simple hydrides H_2O, NH_3 and HCl, the laws of chemical combination by volume were developed first. Combination by weight was then introduced via the use of gas densities. Selecting the density of hydrogen at STP as a standard, Hofmann assigned each element and compound a real or hypothetical (for nonvolatile species) relative "Volumgewichte" at STP which allowed him to translate the volume formulas and reaction equations developed earlier in the book into the corresponding weight or mass relations.

In order to facilitate the use of his relative "Volumgewichte" or specific gravity scale, Hofmann further proposed that it be measured in units of *criths*, a name derived from the Greek word for a barleycorn, in analogy with the word *grain* - a commonly used mass unit in pharmacy. Thus, his standard of one liter of hydrogen at STP, with a conventional mass of 0.0896 g, weighed one crith on his new scale, a liter of chlorine weighed 35.5 criths, a liter of oxygen weighed 16 criths, etc.

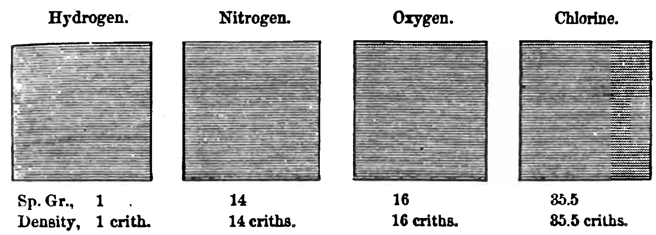
Having finally developed a self-consistent experimental basis for composition by both volume and mass, Hofmann completed his lectures by introducing the hypothesis of atoms and molecules, eventually reaching the conclusion that a self-consistent set of atomic and molecular weights could be assigned which were, for the vast majority of substances, twice the numerical value of their experimental "Volumgewichte" measured in criths.

From Hofmann's book, the crith quickly made its way into a number of contemporary British textbooks (5), the most notable of which was Edward Frankland's *Lecture Notes for Chemical Students* (6) and from there, if we are to believe the acknowledgments in the introduction, to the United States and into Josiah Parsons Cooke's textbook, *First Principles of Chemical Philosophy*, published in 1868 (7). Cooke (1827-1894), who was Erving Professor of Chemistry and Mineralogy at Harvard, had pioneered the teaching of quantitative stoichiometric calculations to beginning students in chemistry (8) and, in his *Chemical Philosophy*, he further introduced example calculations involving the use of the crith. Though he worked these as a series of proportions, they were, in terms of the modern technique of unit cancellation, equivalent to entering and leaving the following sequence of conversions (where c stands for crith) at whichever points were required by the problem in question:

Josiah Parsons Cooke

$$g_A \leftrightarrow c_A \leftrightarrow L_A \leftrightarrow L_B \leftrightarrow c_B \leftrightarrow g_B$$

Implicitly, this meant that one was reading the coefficients in an equation or formula in liters and was consequently using a "mole-like" unit of comparison whose numerical value was determined by the number of molecules in one liter of an ideal gas at STP. The inconvenience, of course, was that the "Volumgewichte" represented by a formula was not equal to



An illustration of the crith concept from Cooke's 1874 text (9)

its atomic or molecular mass but to half its value in units of criths.

Cooke explicitly addressed this problem in 1874 in a book of popular lectures on chemistry which he had delivered at the Lowell Institute in Boston two years earlier (9). Entitled *The New Chemistry*, it was similar in tone to Hofmann's earlier volume in its insistence that a fundamental change had taken place in chemistry in recent years - a change which Cooke characterized as having "the great law of Avogadro" at its base and the doctrine of valence as "its most distinctive feature".

In this work Cooke again introduced the crith and clearly developed the implied relation between the "Volumgewichte" or specific gravity of a gas in criths and its molecular weight (p. 71):

> ... represent by n the constant number of molecules, some billion billions, which a litre of each and every gas contains, when under standard conditions of temperature and pressure. Then the weight of each molecule of hydrogen will be 1/n of a crith, and that of each molecule of oxygen 16/n of a crith, and evidently, 1/n:16/n = 1:16. That is, again, the weights of the molecules have the same relation to each other as the weights of the equal gas-volumes.

Cooke then proceeded to remove the troublesome factor of two and to introduce the microcrith (pp. 72-73):

> Unfortunately, however, for the simplicity of our system, but for reasons which will soon appear, it has been decided to adopt as our unit of molecular weight not a whole hydrogen molecule [as numerically implied by the crith scale] but the half molecule ... In order to give a still greater definiteness to our conceptions, I propose to call the unit of molecular weight we have adopted a *microcrith*,

even at the risk of coining a new word. We have already become familiar with the crith, the weight of one litre of hydrogen, and I will now ask you to accept another unit of weight, the half-hydrogen molecule, which we will call for the future a microcrith. Although a unit of a very different order of magnitude, as its name implies, the microcrith is just as real a weight as the crith or the gramme.

In other words, Cooke had introduced an atomic mass unit based on the standard H = 1.

Indeed, later in the book, he even went so far as to approximate the conversion factor between the crith and microcrith and, by implication, between the microcrith and the gram (p. 75):

According to Thompson, one cubic inch of any perfect gas contains, under standard conditions, 10^{23} molecules. Hence, one litre contains 61 x 10^{23} molecules and 1 crith = 122 x 10^{23} microcriths.

Comparing for effect this number with the estimated mass of the earth, Cooke admitted that "the limit of error" was larger but felt certain that "this difference is one which future investigation will in all probability remove".

From Cooke's *New Chemistry* both the crith and the microcrith (now abbreviated as m.c.) proceeded to make their way into a number of high school chemistry texts published in the 1880's and 1890's, including those by Youmans (1881) (10), Avery (1881) (11), Clarke (1884) (12), and Williams (1896, 1897) (13,14). In fact, Avery even went so far as to include both composition diagrams and a table of atomic weights explicitly labeled in units of microcriths. Interestingly, however, the author has never encountered either a foreign or a college-level chemistry textbook which made reference to the microcrith, though, as mentioned earlier, several did make use of the crith, and by 1900 most of the later editions of the above texts had deleted all references to both units (15). Why was the microcrith confined largely to American high school chemistry texts and what accounts for its decline by the turn of the century?

There are a number of plausible answers to both of these questions. Cooke was extremely influential in shaping the content of the high school chemistry course in the United States in the last quarter of the 19th century. His *New Chemistry* was a popular exposition of recent advances in chemical theory which served as an easily accessible reference for high school authors seeking to update their introductory textbooks - many

O 16 *m.c.*	+	O 16 *m.c.*	+	S 32 *m.c.*	=	SO_2, 64 *m.c.*

A microcrith composition diagram from Avery's 1881 text (11)

Name.	*Symbol.*	*Microcriths.*	*Name.*	*Symbol.*	*Microcriths.*
Aluminum	Al	27.3	Gold (*aurum*)	Au	196.2
Antimony (*stibium*)	Sb	123	Hydrogen	H	1
Arsenic	As	74.9	*Indium*	In	113.4
Barium	Ba	136.8	Iodine	I	126.53
Beryllium	Be		*Iridium*	Ir	192.7
(*See Glucinum.*)			Iron	Fe	55.9
Bismuth	Bi	210	*Lanthanum*	La	139
Boron	B	11	Lead (*plumbum*)	Pb	206.4
Bromine	Br	79.75	*Lithium*	Li	7.01
Cadmium	Cd	111.6	Magnesium	Mg	23.98
Cæsium	Cs	132.5	Manganese	Mn	54.8
Calcium	Ca	39.9	Mercury (*hydrargyrum*)	Hg	199.8
Carbon	C	11.97	*Molybdenum*	Mo	95.8
Cerium	Ce	141.2	Nickel	Ni	58.6
Chlorine	Cl	35.37	*Niobium* (*See Columbium*)	Nb	
Chromium	Cr	52.4	Nitrogen	N	14.01
Cobalt	Co	58.6	*Norwegium*	No.	72.
Columbium	Cb	94	*Osmium*	Os	198 6
Copper (*cuprum*)	Cu	63.1	Oxygen	O	15.96
Davyum	Da	153	*Palladium*	Pd	106.2
Decipium	De	157	Phosphorus	P	30.96
Didymium	Di	147	Platinum	Pt	196.7
Erbium	Er	169	Potassium (*kalium*)	K	39.04
Fluorine	F	19.1	*Rhodium*	Rh	104.1
Gallium	Ga	69.8	*Rubidium*	Rb	85.2
Germanium			*Ruthenium*	Ru	103.5
Glucinium (*See Glucinum*)			*Selenium*	Se	79
Glucinum	Gl	92	Silicium (*See Silicon.*)	Si	

Part of an atomic weight table in microcrith units from Avery's 1881 text (11)

of whom lacked professional training as chemists. Even more importantly, Cooke had issued an influential pamphlet outlining his (and, by implication, Harvard's) conception of the minimum requirements for an acceptable high school laboratory course in chemistry (16). "The Pamphlet", as it came to be called, was widely known among high school teachers during the last quarter of the 19th century and it is only natural that the teachers also paid attention to Cooke's other chemical writings - an obligation not felt by chemists at the college level or in other countries.

By 1900, however, Cooke's influence was on the decline. In addition, the establishment of the first International Committee on Atomic Weights the same year led to an official adoption of an atomic weight scale based on the O = 16 standard rather than the H = 1 standard, which was the basis of the microcrith unit. Although the H = 1 scale was (and still is) pedagogically attractive and the burst of enthusiasm for gas density measurements in the 1860's had focused attention on the volatile hydrides used to such good advantage by Hofmann in his book, the fact remained that oxygen formed a much greater range of stable compounds. Consequently, as Berzelius had argued many years earlier, much more accurate atomic weights could be derived from the use of an oxyen standard and the direct gravimetric analyses of oxides. The limited number of known hydrides, on the other hand, prevented such a direct comparison for the H standard and the use of oxides with this standard required an indirect calculation, whose accuracy was, in turn, limited by the accuracy of the known H:O value derived from the analysis of water (17). And so the crith and microcrith faded from memory and the situation stabilized until the discovery of isotopes, the development of accurate mass spectrometers and the coming of the ^{12}C scale and the unified atomic mass unit.

References and Notes

1. For a recent example, see R. J. Gillespie, D. A. Humphreys, N. C. Baird and E. A. Robinson, *Chemistry*, Allyn and Bacon, Boston, MA, 1986, p. A-13. Other texts continue to divide the atomic mass in u by 1u so as to generate unitless relative atomic masses. See G. W. Castellan, *Physical Chemistry*, 3rd ed., Addison-Wesley, Reading, MA, 1983, p. 2.

2. A. W. Hofmann, *Introduction to Modern Chemistry, Experimental and Theoretic*, Walton and Maberley, London, 1865.

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9. J. P. Cooke, *The New Chemistry*, Appleton, NY, 1874, pp. 70-76, 120-121.

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12. F. W. Clarke, *The Elements of Chemistry*, American Book Co., NY, 1884, pp. 19, 72-73.

13. R. P. Williams, *Elements of Chemistry*, Ginn, Boston, MA, 1897, p. 15, 217.

14. R. P. Williams, *Introduction to Chemical Science*, Ginn, Boston, MA, 1896, p. 108.

15. Thus neither F. W. Clarke and L. M. Dennis, *Elementary Chemistry*, American Book Co., NY, 1902 or E. M. Avery, *The School Chemistry*, American Book Co., NY, 1904 continued to discuss the crith and microcrith.

16. J. P. Cooke, *Descriptive List of Experiments on the Fundamental Principles of Chemistry*, 3rd ed., Harvard, 1893. The influence of the pamphlet is discussed in S. Rosen, "The Rise of High-School Chemistry in America", *J. Chem. Educ.*, **1956**, *33*, 627.

17. See the interesting discussion in J. W. Mellor, *Modern Inorganic Chemistry*, Longmans, Green & Co., London, 1927, pp. 81-82.

William B. Jensen holds the Oesper Position in Chemical Education and the History of Chemistry at the University of Cincinnati, Cincinnati, OH 45221, and is interested in the history of chemical education and the history of 19th and early 20th century physical chemistry and inorganic chemistry.

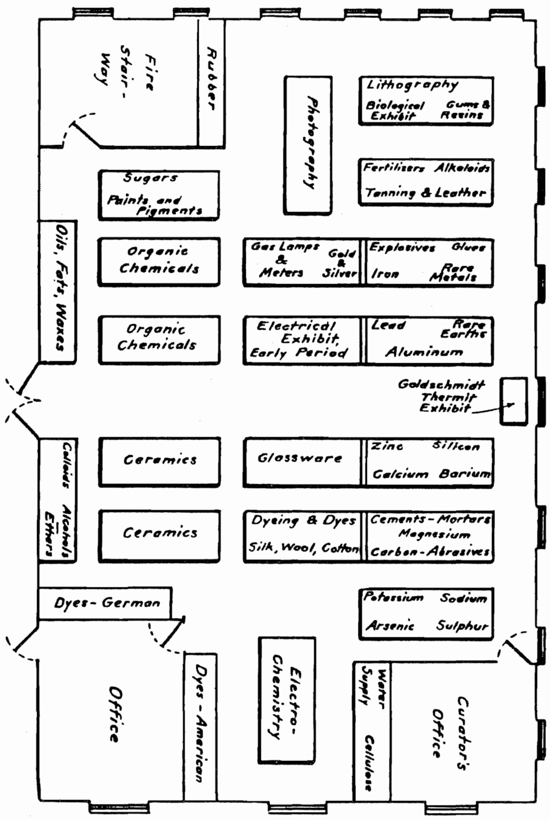
CHEMICAL ARTIFACTS

The Chandler Chemical Museum

Leonard Fine, Columbia University

The Chandler Chemical Museum is a unique record of many aspects of the history of American chemistry. As the last and largest of the great 18th and 19th century "philosophical cabinets," it is a collection of unparalleled significance for understanding changing patterns of chemical pedagogy. As a diverse selection of chemical artifacts, it is a rich resource for students of the history of chemical technology. And as a legacy of Charles Frederick Chandler's multifaceted contributions to chemistry and commerce, dating from the founding of the Columbia School of Mines in 1866, it is an important element of the history of Columbia University, of the City of New York, and of the Chemist's Club and the

Charles Frederick Chandler



The floor plan to the Chandler Chemical Museum as it appeared in 1934 (1).

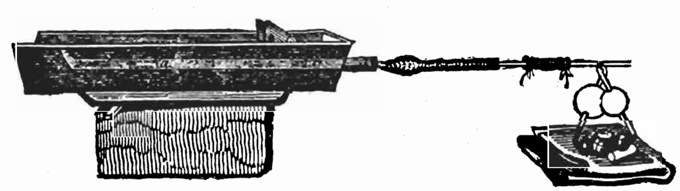
American Chemical Society. Just fifty years ago, Samuel Tucker, the then curator of the Chandler Chemical Museum, described it to Columbia President Nicholas Murray Butler as "the most unique chemical collection that can be found." On the eve of the completion of the third home for the museum, within the new Center for Chemical Research at Columbia University, Tucker's observation is truer than ever.

Charles Frederick Chandler (1836-1925) is the patron saint of chemistry at Columbia and was one of the founding fathers of the American Chemical Society. A student of Horsford at Harvard, of Wöhler at Göttingen, and of Rose at Berlin, Chandler began his teaching career at Union College in 1856. In 1864 he left Union for New York City in order to help found the Columbia School of Mines, where he remained until his retirement in 1911. The Chandler Chemical Museum was started in order, as he liked to say, "to show his boys" the things he talked about in his lectures. Beginning with the first ledger entry of the museum (dated February, 1864), this remarkable collection consists of some 12,000 specimens uniquely illustrating the rise and development of industrial chemistry in the 19th and early 20th century. It stands today as one of Chandler's most memorable achievements.

As Chandler was concerned primarily with the training of industrial-analytical chemists - he was a consulting chemist himself and placed many of his students in industrial positions - the museum collection was organized around topics in applied chemistry, including water chemistry, electrochemistry, synthetic dyes and intermediates, explosives, coal, oil and petroleum chemistry, lighting technology, textiles and ceramics, pharmaceuticals and fermentation chemistry, essential oils, natural polymeric materials such as gums and rubbers, and the first synthetic polymers and plastics. Most of the applications of the day are represented. For instance, there is a complete collection of synthetic drugs and dyes, representing the essence of the European origins of modern organic chemistry, including Perkin's original mauvine and original industrial samples of vat dyes and pigments. It is useful to remember that this collection reflects what was considered "high tech" in its day. Indeed, during World War I, when German resources were unavailable, the collection was used as a source of standards by industrial chemists attempting to develop America's own fledgling dye industry. Rubber samples from every part of the 19th century world; bricks, abrasives and materials of construction; early ceramic constructions and samples of aluminum metal prepared by Hall, Deville, Castner and Heroult are also to be found. The collection of old Limoges porcelains and apothecary jars forms a very special part of the museum which, because of its artistic as well as historic value, has been separated from the main collection and is now kept by Columbia University Art Properties.

The electrochemical collection is surprising, in part because it reflects the renaissance nature of 19th century chemistry as it merged into modern times. Included are voltaic piles, primary batteries and cells, and storage batteries, among which are the Edison alkaline cell and the Wallace dynamo (1877).

The photographic collection is one of intrinsic historical value. It includes large numbers of daguerrotypes and early tintypes; the works of Woodbury and Fox Talbot, Ives, Osborn, and Bierstadt. Also present are the motion studies of Muybridge, shown at the Centennial Exhibition in 1876, early Edison moving pictures, Rutherford's photograph of the Moon (1854), and the first portrait from life made on the roof of one of the Columbia buildings in 1840 by Professor Draper. There is also a collection of cameras and equipment

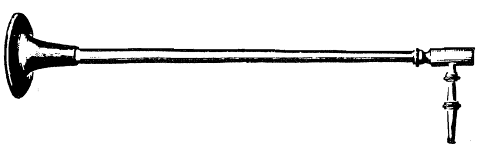


An early combustion train (2).

dating from the middle of the 19th century, including a very rare combination speed camera that "snaps" six pictures in ten minutes - provided the subject is in bright sunlight. An outstanding piece in this part of the collection is the camera owned by Karl Klietsch, a pioneer German photographer.

The extensive collection of elements and compounds includes a fine selection of rare earth elements, radioactive materials and very early X-ray photographs. Some of the X-ray glass plate negatives and positives belonged to Michael Pupin and date to within a few weeks of Roentgen's discovery. The match collection is striking.

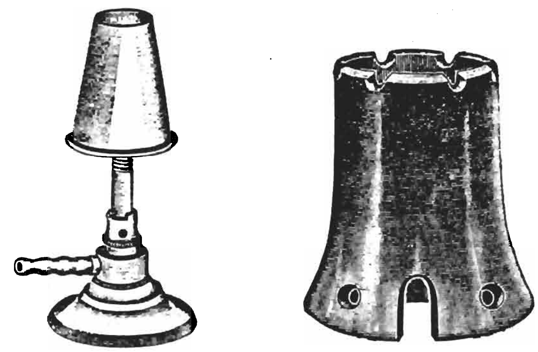
Though intended primarily as a teaching museum in chemical technology, rather than as a museum for the history of chemistry, the collection nevertheless contains a number of items of interest to the historian of pure chemistry. Historic pieces of laboratory apparatus include items that belonged to Priestley, Pasteur, Faraday, and Fritz Haber. The collection of batteries and electrical devices contains many items which were standard laboratory fare in the 19th century and the



A Plattner blowpipe with a detachable mouthpiece (3).

same is true of the collection of gas lamps, which contains a number of early laboratory models, including an all porcelain (corrosion-free) gas burner and several multiburner combustion units. Other pieces of basic laboratory apparatus found their way into the museum via displays illustrating significant advances in chemical analysis, including a complete Plattner blowpipe, and three complete combustion trains used to illustrate the development of organic analysis. These range from a facsimile of Liebig's original apparatus to a complete Pregl microanalysis train.

Other items of interest include a set of valence models from the 1870's, a collection of medallions and framed portraits of famous chemists, a collection of autographs and letters of famous 18th and 19th century scientists, a collection of presentation photographs of turn-of-the-century American and British chemists given to Chandler during his term as President of the Society for Chemical Industry, Laudy's original photographs and glass plate negatives of the 1874 Priestley Centennial Meeting at Northumberland, a scrapbook on Liebig and his laboratory at Giessen, an unpublished autographed pencil sketch of Wöhler, and several letters from Wöhler to Chandler dating from 1862. Miscellaneous items include such things as a porcelain retort, an earthenware burner guard, a collection of apparatus for the testing of oils, and, of course, an unparalleled collection of display bottles and containers.



A porcelain laboratory burner (left) and an earthenware burner guard (right) (3).

After Chandler's death in 1925 the museum underwent a gradual decline. This is not too surprising, as even by the 1920's the type of generalized industrial-analytical chemist it was designed to train was already being displaced by the professional chemical engineer, on the one hand, and by the specialized industrial research chemist, on the other. Though a curator was appointed in 1924 and again in 1928, by 1934 care of the museum had devolved on two graduate students from the department of chemical engineering and the last changes in the displays appear to have been made sometime in the 1950's. Space needs also took their toll. Part of the front of the museum was taken to create a back hallway for a new elevator and the back two corners were partitioned off for classrooms. These changes severely restricted the space available for displays so that a storage mezzanine had to be added. Finally, in the summer of 1986, the museum was cataloged, disassembled and placed in storage as part of the reconstruction of Havemeyer Hall, which had housed it since 1896. A new museum is expected to emerge in about two years, as part of the last phase of construction. We hope that Chandler will not be disappointed.

Illustrations

1. R. H. McKee, C. E. Scott and C. B. F. Young, "The Chandler Chemical Museum at Columbia University", *J. Chem. Educ.*, **1934**, *11*, 275.

2. W. Gregory, *Outlines of Organic Chemistry*, appended to E. Turner, *Elements of Chemistry*, 7th Ed., Thomas, Cowperthwait & Co., Phildadelphia, PA. 1846, p. 793.

3. *Price List of Scientific Laboratory Apparatus*, E. H. Sargent & Co., Chicago, IL, 1914.

Leonard W. Fine is director of the undergraduate program in chemistry at Columbia University, New York, NY 10027 and is interested in the historical development of radioactivity.

BOOK NOTES

Essays in Chemical History, W. A. E. McBryde, Peter Chung Chieh and Elisabeth A. Dixon (Editors), Canadian Society for Chemistry, Ottawa, Ontario, Canada, 1988. i + 79 pp. Paper (Typeset). $10.00 (US), $12.50 (Canadian).

This small volume of essays is based on papers delivered at a symposium on the history of chemistry held in 1983 at Calgary by the Chemical Education Division of the Canadian Society for Chemistry. All but three of the eight essays in the book are relatively straightforward biographical accounts of Canadian chemists, ranging from W. A. E. McBryde's carefully documented account of the career of Henry Croft, the first Professor of Chemistry at the University of Toronto, to N. T. Gridgeman's delightfully entertaining tale of the somewhat eccentric career of Donald F. Stedman of the Canadian National Research Council.

The remaining essays treat the careers of Otto Maass, Osmand J. Walker and Thorberger Thorvaldsen; the origins of the Chemical Institute of Canada; the teaching of history of chemistry at the University of Toronto; and the development of temperature-dependency equations in chemical kinetics. Only the last named essay, by K. J. Laidler, is truly disappointing, being little more than an abstract of a previously published (but otherwise excellent) paper in the *Journal of Chemical Education*. Ultimately, however, it is probably the biographical accounts which will prove to be of lasting value and which point to what one hopes will be a growing interest in the history and development of the Canadian chemical community.

Copies of the above book may be ordered from the Publications Department, Chemical Institute of Canada, 1785 Alta Vista Drive, Suite 300, Ottawa, Ontario, Canada, K1G 346 or from Chem 13 News, University of Waterloo, Waterloo, Ontario, Canada, N2L 3G1. Also include $1.00 for postage.

Chemistry in America 1876-1976: Historical Indicators, Arnold Thackray, Jeffrey L. Sturchio, P. Thomas Carroll, and Robert Bud, Reidel, Dordrecht, 1985. xxiii + 564 pp. Cloth (Typeset) $111.50, Paper $24.00.

By now this well-known book is (or should be) on the shelves of virtually every university library in the country. The good news, however, is that Kluwer has just released a paper edition with a purchase price which should also place it on the shelves of every chemist and historian of science - or certainly on the shelves of those who are working on departmental histories or are otherwise seriously interested in either the history of chemical education in the United States or the development of the American chemical community in general.

As the book's subtitle indicates, it attempts to provide statistical indices (usually in the form of graphs) of various trends which can be used to characterize (or otherwise act as indicators of) the growth and development of the American chemical profession in the century spanning the founding of the American Chemical Society (1876) and the near present (1976). Typical data sets and graphs range from trends in the total number of chemists in the U.S., through trends in the number of undergraduate and graduate-level degrees given in chemistry, the annual high school chemistry enrollment, and the total number of industrial research laboratories, to data on the citation rate of American papers in the chemical literature. More importantly, each data set is plotted in several alternative ways, in order to highlight various subtleties in the trends, and is also plotted relative to larger data sets which help to place the purely chemical information within its proper social context. Thus, for example, not only does one have a plot of the number of doctorates given in chemistry, but a comparison of this with the number given in all of the natural sciences, as well as in all fields in general - a result which shows that, although the number of degrees given in chemistry has displayed an exponential growth, it has actually declined relative to the total number of doctorates being granted in all fields.

Each data set is accompanied by a detailed historical analysis of the trends indicated by the graphs, and the volume is completed by detailed appendices on the data sources, the assumptions used in compiling and analyzing the data, and by an excellent bibliography and index.

A special discount coupon for members of the division wishing to order this volume can be found on the back cover.

TRANSLATIONS

The following experiment is again taken from Tiberius Cavello's "A Treatise on the Nature and Properties of Air," London, 1781. Readers wishing to submit their interpretations of the chemistry involved, complete with balanced equations, should send their answers to the editor by the copy due date listed inside the front cover. Answers will appear in the next issue along with a fresh puzzle.

To make Homberg's Pyrophorus: Mix together one part of sugar and three parts of alum; and let this mixture be melted and dried in an iron shovel over the fire, till it becomes a dark brown or blackish powder. In this operation it must be often stirred with an iron spatula. Any large pieces of this coaly matter must be bruised into a powder, and then must be put into a glass matrass or vial, having a long neck, and rather narrow than large. This matrass must then be placed in a crucible, or other earthen vessel, large enough to contain the body of the matrass, and about half an inch besides all round it, which space is to be filled with dry sand. This apparatus must then be put into the fire which must be raised gradually, till the whole becomes red hot, in which state it must be kept for about one hour or till a quarter of an hour after a weak sulphurous flame has begun to appear at the mouth of the matrass. The apparatus is then to be removed from the fire, and the moment that it loses its redness, the mouth of the matrass must be stopped with a cork, and when the whole is sufficiently, though not quite cold, the matrass must be taken out of the crucible, and the pyrophorus it contains, which is a blackish, mostly granulated powder, must be decanted into a dry phial, which must afterwards be kept exactly stopped, in order to preserve the pyrophorus for a long time. The principal properties of this substance are the following: As soon as a small quantity (sometimes a few grains of it are enough) of it is exposed to the open air, it quickly becomes red hot, and is capable of setting fire to paper, tinder, etc. If the air, and substance upon which the pyrophorus is dropped, are very dry, the accension is slowly, and sometimes not at all effected; but it may be promoted by breathing upon it; which shows that the pyrophorus requires moisture as well as the presence of air, in order to take fire. If the bottle is not closed very well, the pyrophorus will imbibe the moisture by small degrees, so as to lose its burning property in a short time. After combustion, the pyrophorus, or rather its ashes, will be found to be increased in weight. Although alum and sugar were directed above to be used for making the pyrophorus, yet it may be made with other matters, though perhaps not so well, nor with so much certainty; for the necessary and principal ingredients are the vitriolic acid and phlogiston; hence it may be made with any vitriolic salt besides alum, and almost any other substance capable of furnishing the inflammable principle, besides sugar.

The Answer to Last Issue's Puzzle

Aqua regia is a combination of the strong acids, nitric acid and hydrochloric acid. Traditionally this liquid was made using one part of nitric acid and three parts of hydrochloric acid. However, Cavello states his aqua regia is made with four parts of "nitrous" (nitric) acid and only one part of "marine" (hydrochloric) acid. This probably was to limit the production of chlorine gas for the following reaction:

$$4H_3O^+(aq) + 3Cl^-(aq) + NO_3^-(aq) \leftrightarrow NOCl + Cl_2(g) + 6H_2O$$

which occurs because the nitrosyl chloride present in the mixture catalyzes the reaction (1).

Regulus of antimony is the product of heating stibnite, Sb_2S_3, with lead in a furnace. The regulus metal is a 5-12% antimony compound containing some iron impurities (2). Grinding the regulus to a powder would expose some "free" antimony and facilitate the reaction.

The regulus powder reacts in the manner described by Cavello due to the reaction:

$$Sb(s) + 3/2\ Cl_2(g) \leftrightarrow SbCl_3(s);\quad \Delta H_f^\circ = -382.5 kJ\ mol^{-1}$$

The heat of formation shows the exothermicity of the reaction which would account for the light seen as the antimony and chlorine come into contact. This reaction occurs at a "micro-level" because of the minute quantities of antimony and chlorine which come into contact; therefore, only a flash of light is seen. Antimony does not react with HNO_3 (3) and its high reactivity with chlorine is presented in many textbook photographs, such as the one on page 56 of our text at Notre Dame, *General Chemistry*, 2nd ed., by McQuarrie and Rock.

Karen M. Morris, University of Notre Dame

References and Notes

1. M. C. Sneed and R. C. Brasted, *Comprehensive Inorganic Chemistry*, Vol. 5, D. Van Nostrand Co., Inc., New Jersey, 1956, p. 95.

2. W. Gardner and E. I. Cooke, Eds., *Chemical Synonyms and Trade Names*, 5th ed., Technical Press Ltd., London, 1948, p. 433.

3. W. H. Nebergall, H. F. Holtzclaw, Jr., and W. R. Robinson, *General Chemistry*, 6th ed., D. C. Heath and Co., Lexington, MA, 1980, pp. 935-937.

Hints for the Perplexed: Help in deciphering 18th-century chemical nomenclature and terminology for apparatus can be found by consulting Jon Eklund, "The Incomplete Chymist: Being an Essay on the Eighteenth-Century Chemist and His Laboratory, with a Dictionary of Obsolete Chemical Terms of the Period," Smithsonian Press, Washington, D.C., 1975 and W. Gardner and E. I. Cooke, "Chemical Synonyms and Trade Names," 6th Ed., CRC Press, Cleveland, 1968.

REPORT OF THE PROGRAM CHAIR

The obvious highlight of this meeting was the seven-session symposium on the History of Electrochemistry. Almost 40 papers on topics ranging from classical electrochemistry to such modern topics as electrodeless conductivity were presented over a four-day period. The speakers, in keeping with the international character of the meeting, came from many places on the globe including the United Kingdom and Czechoslovakia, as well as the expected speakers from the host countries of Canada, the United States and Mexico. In addition to Classical Electrochemistry, other topics included Electrosynthesis, Electroanalytical Chemistry, Fundamental Electrochemistry, Industrial Electrochemistry, Electrode Systems and pH Measurement. This symposium, organized by John Stock of the University of Connecticut, will be published as an ACS Symposium Series Volume some time later this year. Division members will receive a substantial discount if they purchase the book using the coupon which will appear in this *Bulletin.*

Other features of the program were two half-day sessions of general papers dealing with interesting chemical personalities, industries specific to Canada, textbooks, chemical education and biochemistry. The regular presidential cachet paper was replaced, appropriately enough for this meeting, by a paper on the 1893 World's Congress of Chemists.

One very lovely feature among the HIST-related events was the opening of the Croft Chapter House, the first chemistry laboratory at the University of Toronto, and the display therein of chemical memorabilia held by the University. This event was orchestrated by Drs. W. A. E. McBryde and R. Freisen of the University of Waterloo with the cooperation of the University of Toronto Archivist, Dr. Richardson.

I would like to commend my two programming counterparts who so ably worked with me in preparation for this meeting, Dr. W. A. E. (Peter) McBryde and Dr. Silvia Tejada from UNAM, Mexico City.

Finally, a brief reminder that the Los Angeles meeting is almost here. The Hahn/Strassmann Golden Anniversary Symposium will take place on Monday, and the Dexter Award Session and Luncheon will be on Tuesday. Also on Tuesday will be the third in our series of Information Sources in the History of Chemistry, and specifically California and the West Coast. Please also note that the deadline for paper titles for the Dallas meeting is November 20.

Mary Virginia Orna, College of New Rochelle

AWARDS

The Dexter Award

The 1988 Dexter Award for outstanding accomplishment in the history of chemistry has been awarded to Dr. Lutz F. Haber of Bath, England. The award, which consists of a cash prize of $2,000 and an engraved plaque, will be presented to Dr. Haber at the Divisional Luncheon in Los Angeles.

Born in Berlin in 1921, the son of Charlotte Nathan and Fritz Haber, winner of the 1919 Nobel Prize in Chemistry, Dr. Haber received his early education in Germany and Switzerland. Moving to England in 1936, he received a B.Sc. in Economics from the London School of Economics and a Ph.D. from the University of London. His subsequent career has spanned the private industrial sector, government employment and academia. From 1946-1949 he worked for an oil refinery in Manchester; from 1949-1963 for I.C.I. Ltd., and from 1963-1967 for Esso. This was followed by a three-year stint with the National Economic Development Office and by his appointment in 1970 as Reader in Economics at the University of Surrey-Guildford, from which he retired in 1986.

Dr. Lutz F. Haber

Dr. Haber's contributions to the history of chemistry rest on his two book-length studies of the European chemical industry: *The Chemical Industry During the 19th Century* and *The Chemical Industry: 1900-1930* and his volume *The Poisonous Cloud: Chemical Warfare in the First World War*, all of which have been published by Oxford University Press.

Persons wishing to nominate or renominate candidates for the 1989 Dexter Award should send their recommendations to the Divisional Secretary by 1 January 1989. New submissions should include a letter of nomination and a complete vita for the candidate. Reprints of not more than three recent publications may also be included.

The Outstanding Paper Award

The Outstanding Paper Award for 1988 has been awarded to Dr. Jeffrey L. Sturchio of AT&T Bell Labs for his paper "Charles Frederick Chandler (1836-1925) and the American Chemical Society," presented at the 1987 Spring National Meeting in Denver, Colorado.

Dr. Sturchio holds a B.A. in History from Princeton University and a Ph.D. in the History and Sociology of Science from the University of Pennsylvania. After teaching at the New Jersey Institute of Technology, he was appointed in 1984 as the Associate Director of the Center for History of Chemistry, a position which he held until his transfer to Bell Laboratories early this year.

Besides his activities on the Executive Committee of HIST, Dr. Sturchio is active in the Society for the History of Technology and the History of Science Society, where he has served in various advisory and editorial capacities. In addition to numerous papers, he is a coauthor of the volume *Chemistry in America, 1876 - 1976: Historical Indicators* and has also contributed to *Corporate History and the Chemical Industries: A Resource Guide.* His current research interests focus on the history of industrial research and development in the United States, the history of polymers and material science, and the relations of science, technology and urban culture in late 19th-century America.

Dr. Jeffrey L. Sturchio

NOTES FROM MEMBERS

William A. Cole (Pacific Palisades, CA) has recently had a book entitled *Chemical Literature: 1700-1860* published by Mansell of London. The book is a detailed annotated bibliography of more than 1400 selected items belonging to the *William A. Cole Collection of Books on the History of Chemistry*, and selected as representing major contributions to the chemical literature of the period.

Bert Ramsay (Eastern Michigan University) reports that he has been promoted from associate to full member of the ACS Committee on Meetings and Expositions for 1988.

John Wotiz (University of Southern Illinois-Carbondale) recently participated in a Presidential Conference on "Chemistry in the Museum Environment" sponsored by the ACS and the Smithsonian Institution.

Dr. Raymond B. Seymour (University of Southern Mississippi) has recently been inducted into the Plastics Hall of Fame. Dr. Seymour has organized numerous symposia on the history of polymers and plastics for HIST.

EVENTS OF INTEREST

* The Oesper Collection in the History of Chemistry of the University of Cincinnati will sponsor a museum display entitled *Two Centuries of the Chemistry Set* from 15 October 1988 through 15 March 1989. The display will feature advertisements, books, photographs and actual chemistry sets spanning the period 1789-1989. A booklet based on the display will be available by 15 January 1989 for the price of $5.00. Persons interested in viewing the display or in ordering the booklet should contact Dr. William B. Jensen, Department of Chemistry, University of Cincinnati, Cincinnati, OH 45221-0172, or phone (513) 475-4005.

* The Department of Chemistry and Biochemistry and the International Projects and Services of Southern Illinois University at Carbondale, Illinois are arranging the *Tenth European History of Chemistry Tour* in June and July, 1989. Professor John H. Wotiz will again be the tour director and instructor. Ten European countries will be visited, with stops in places where the history of chemistry was made, is on exhibit, or where Professor Wotiz has made special arrangements to hear lectures by local historians. The first tour was described in the *Journal of Chemical Education*, **1972**, *49*, 593 and many of the places that will be visited are listed in Professor Wotiz's "Science Museum Guide" which appeared in *CHEMTECH*, **1982**, *12*, 221. Participation for periods of less than eight weeks will be possible. The tour should be of special interest to science teachers and professors who like to combine self-improvement with European sightseeing. Family members of participants will also be able to join the tour. University registration for credit or audit is required. All inquiries should be directed to the tour leader: Dr. John H. Wotiz, Department of Chemistry and Biochemistry, Southern Illinois University, Carbondale, IL 62901, Phone: 618-453-5721 (Office), 618-549-4220 (Home).

* The Beckman Center for History of Chemistry announces a program of small travel grants, to enable interested individuals to visit Philadelphia to make use of the research resources of the Beckman Center, the Edgar Fahs Smith Collection and other associated facilities, including the historical collections of the Chemist's Club. Grants, which may be used for travel, subsistence, and copying costs, will not normally exceed $300. Applications should include a vita, a one paragraph statement on the research proposed, a budget, and the addresses and telelphone numbers of two references. Applications may be sent at any time to Dr. Mary Ellen Bowden, Assistant Director (Programs), Beckman Center for History of Chemistry, 3401 Walnut Street, Philadelphia, PA 19104-6228, Phone (215) 898-4896.

FUTURE MEETINGS

Dallas .... 9-14 April 1989

Five copies of 150-word abstract (original on ACS Abstract Form) by 1 December 1988. Title of paper by 20 November 1988.

* *General Papers.* Contact M. V. Orna, HIST Program Chair, Department of Chemistry, College of New Rochelle, New Rochelle, NY 10801, Phone (914) 654-5302.
* *The Bicentennial of the Revolution of Modern Chemistry.* Organized by J. A. Miller, Department of Chemistry, University of Missouri-St. Louis, MO 63121, Phone (314) 553-5311.
* *The Role of Chemistry in Petroleum Discovery and Production - Historical Perspectives* (Cosponsored by PETR). Organized by J. K. Borchardt, Shell Development Co., P.O. Box 1380, Houston, TX 77251-1380, Phone (713) 493-8237.
* *Chemical Trivia III.* Organized by James J. Bohning, Department of Chemistry, Wilkes College, Wilkes-Barre, PA 18766, Phone (717) 824-4651.
* *True Stories of Small Chemical Businesses* (Cosponsored by SChB).

Miami Beach .... 10-15 September 1989

Five copies of 150-word abstract (original on ACS Abstract Form) by 1 May 1989. Title of paper by 15 April 1989.

* *General Papers.* Contact M. V. Orna (see address above).
* *History of Biotechnology.* Organized by J. L. Sturchio, Archives and Records Management Services, AT&T Bell Labs/ WVA201, 5 Reiman Road, Warren, NJ 07060, Phone (201) 756-1591.
* *Polymeric Organic Coatings: Their Origins and Development.* Organized by R. B. Seymour, Department of Polymer Science, University of Southern Mississippi, Southern Station, Box 10076, Hattiesburg, MS 39406, Phone (601) 266-4868.
* *Impact of Radiopharmaceuticals on the Frontiers of Chemistry and Medicine.* Organized by R. M. Lambrecht, Radionuclide and Cyclotron Operations, King Faisal Specialist Hospital and Research Centre, P.O. Box 3354, Riyadh 11211, Kingdom of Saudi Arabia.
* *History of Fertilizers* (Cosponsored by FERT).
* *True Stories of Small Chemical Businesses* (Cosponsored by SChB).

Boston .... 22-27 April 1990

Five copies of 150-word abstract (original on ACS Abstract Form) by 1 December 1989. Title of paper by 1 November 1989.

* *General Papers.* Contact M. V. Orna (see address above).
* *The 1890 Benzol Fest 100 Years Later.* Organized by J. H. Wotiz, Department of Chemistry, Southern Illinois University at Carbondale, Carbondale, IL 62901, Phone (618) 453-5721.
* *Chemistry in Science Fiction.* Organized by J. J. Bohning, Department of Chemistry, Wilkes College, Wilkes-Barre, PA 18766, Phone (717) 824-4651.
* *Chemistry in Colonial America* (Cosponored by CHED).
* *Wartime Research at RDX and its Political Aftermath.* Organized by J. T. Edwards, Department of Chemistry, McGill University, 801 Sherbrooke St. West, Montreal, PQ, Canada H3A 2K6, Phone (514) 398-6233 or (514) 489-1663.
* *True Stories of Small Chemical Businesses* (Cosponsored by SChB).

Washington .... 26-31 August 1990

* *General Papers.* Contact M. V. Orna (see address above).
* *History of the Development, Use and Testing of Food Additives* (Cosponsored by CHAL). Organized by H. T. McKone, Department of Chemistry, St. Joseph College, W. Hartford, CT 06117, Phone (203) 232-4571.
* *Chemistry and Crime II.* Organized by R. O. Allen, Department of Chemistry, University of Virginia, Charlottesville, VA 22901, Phone (804) 924-3622.
* *History of Environmental Pollution and Protection in Relation to Federal Regulations.* R. Sarmiento, U.S. Environmental Protection Agency, Analytical Chemistry Section, Bldg. 306, BARC-East, Beltsville, MD 20705, Phone (301) 344-2266.
* *True Stories of Small Chemical Businesses* (Cosponsored by SChB).

Atlanta .... 14-19 April 1991

* *General Papers.* Contact M. V. Orna (see address above).
* *Emil Fisher: One Hundred Years of Carbohydrate Chemistry* (Cosponsored by CARB).
* *True Stories of Small Chemical Businesses* (Cosponsored by SChB).

New York .... 25-30 August 1991

* *General Papers.* Contact M. V. Orna (see address above).
* *Chemistry and Crime III - Forensic Methods: Past, Present and Future.* Organized by S. M. Gerber, Color Consultants, 70 Hillcrest Road, Martinsville, NJ 08836, Phone (201) 356-4721; Richard Saferstein, New Jersey Forensic Laboratory, P.O. Box 7068, West Trenton, NJ 08825, Phone (609) 882-2000, Ext. 2692.
* *True Stories of Small Chemical Businesses* (Cosponsored by SChB).

San Francisco .... 5-10 April 1992

* *General Papers.* Contact M. V. Orna (see address above).
* *True Stories of Small Chemical Businesses* (Cosponsored by SChB).

Geneva .... (Date to be Announced)

* *100th Anniversary of the Geneva Conference.* Organized by J. G. Traynham, Department of Chemistry, Louisiana State University, Baton Rouge, LA 70803-1804, Phone (504) 388-3459.

Tentative Future Symposia

(Please contact M. V. Orna if you are interested in organizing or participating in the following.)

* *Development Side of Inventions and Discoveries.*
* *Impact Issue: Biotechnology in Our Lives.*
* *History of Pyrotechnics.*
* *History of Food Chemistry.*
* *History of RDX Research.*
* *Chemistry Potpourri.*

Note: The cosponsored symposia indicated with parentheses will have their primary sponsorships by the divisions so named and the programs will appear under their respective divisional headings.

PLEASE JOIN US AT THE NATIONAL ACS MEETING IN LOS ANGELES ON MONDAY SEPTEMBER 26, 1988 FOR A SPECIAL SYMPOSIUM CELEBRATING THE GOLDEN ANNIVERSARY OF THE HAHN-STRASSMANN EXPERIMENTS AND THE DISCOVERY OF NUCLEAR FISSION

The Scientific Perspective

*** Philip Abelson:**

Identification of Sb, Te and I Products of Fission

*** Karl Cohen:**

Progress and Paradox

*** Alfred Nier:**

Atom Weighing - 1939 and Beyond

*** Genn Seaborg:**

Nuclear Fission and Transuranium Elements - Fifty Years Ago

*** Ellis Steinberg:**

The Radiochemistry of the Fission Products

*** John Wheeler:**

Early Days of Fission - Doorways to New Insights

The Historical Perspective

*** Lawrence Badash:**

Otto Hahn, Science and Social Responsibility

*** Erwin Hiebert:**

Lise Meitner and her Scientific Circle in Berlin

*** Ruth Sime:**

Lise Meitner and the Discovery of Fission

The Literary Perspective

*** Richard Rhodes**:

The Complementarity of the Bomb

The View from the Chair

*** Leonard Fine and Eugene Booth:**

The Hahn - Strassmann Experiment

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William B. Jensen., Editor
Department of Chemistry
University of Cincinnati, M. L. 172
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