# OLD CHEMISTRIES

## Steele's "Fourteen Weeks in Chemistry"

*William D. Williams, Harding University*

*Fourteen Weeks in Chemistry*, by Joel Dorman Steele, was America's most widely used high school chemistry text from 1868 to 1900 and is one of the most frequent "old chemistries" found in today's rare book market. It was the first of a series of science texts by Steele with the similar titles: *Fourteen Weeks in Chemistry* (1867); *Fourteen Weeks in Natural Philosophy* (1869); *Fourteen Weeks in Astronomy* (1869); *Fourteen Weeks in Geology* (1870); *Fourteen Weeks in Physiology* (1872); *Fourteen Weeks in Zoology* (1872); and *Fourteen Weeks in Botany* (1879). His *Key to Practical Questions in Steele's Sciences* (1871) contained answers to questions in the first four books. These works, along with a series of history texts which were coauthored with his wife, sold over one million copies. Several were published in Japanese, his *Astronomy* in Arabic, and his *Chemistry* in a Braille edition. In 1879, his *Chemistry* was used in 60 out of 122 public high schools in larger cities (1). Seven of his texts were still in print in 1928, 42 years after his death. His books made a significant contribution to the popularization of science in America.

Steele made countless addresses to educational, civic, and church meetings. One of particular interest to chemical historians has been preserved. In July 1884, at the Centennial Anniversary of the University of the State of New York, Steele delivered his last public address, "The History of Science Teaching in the Academies of this State." He recalled the early texts of Marcet, Comstock, Phelps, Cleveland, Eaton, etc. He surveyed the apparatus available at various schools and dates, and presented tables of science enrollments from 1800 to 1884. He observed changes in education and technology over the years and closed with his own philosophy of science teaching (2).

A

FOURTEEN WEEKS

COURSE IN CHEMISTRY.

BY

J. DORMAN STEELE, A.M.,

PRINCIPAL OF ELMIRA FREE ACADEMY.

"Bright and glorious is that revelation
Written all over this great world of ours."

LONGFELLOW.

NEW YORK:
A. S. BARNES & Co., 111 & 113 WILLIAM STREET.
BOSTON:
WOOLWORTH, AINSWORTH & Co.

1869.

Joel Dorman Steele

Steele was born on 14 May 1836 in Lima, NY, the son of an itinerant Methodist minister. Graduating in 1858 from Genesee Wesleyan College (later part of Syracuse University), he enthusiastically chose teaching as a career. He was teacher and principal at Mexico, NY (1858-62), Newark, NY (1862-66) and Elmira, NY (1866-72). Recognized as a gifted teacher, he was exceptional in motivating students (3).

While in college Steele had emphasized Latin, literature, and debating. Apparently his science was self taught as he prepared for his own teaching. Although his first book (1867) listed him with an "A.M." degree, there is no evidence that he ever took any graduate work. The degree may have resulted from his four years at Genesee or it may have been honorary. In 1879, he was awarded an honorary Ph.D. for excellence in teaching by the University of the State of New York.

At the outbreak of the Civil War, Steele served as Captain of Company of the 81st New York Volunteers. He was severely wounded early in the fighting at the battle of Seven Pines, VA. After lying near death for some time, he was discharged and returned to his teaching.

Although he taught many subjects, science was Steele's favorite. Finding the available texts too cumbersome and unappealing, he developed his own set of chemistry notes and methods of presentation. He emphasized exploration, imagination, and critical thinking rather than rote memorization of recitation questions, as earlier texts had done. In 1866 he made plans to have his chemistry notes published by a local press. Publisher A. S. Barnes learned of his project and encouraged him to write a simpler chemistry text intended only for high schools. Steele described his feelings upon its publication (4):

> What a Lilliput it seemed—only two hundred and twenty-five 14mo pages of coarse, well leaded type—and what a contrast to the standard Brobdingnags of the day! But it sold! I could scarcely believe the news that came. I had never dared hope that anybody outside the circle of my personal friends would care to buy my book. Yet so it was. An edition of two thousand copies had gone at once and a second edition was to be printed immediately.

The most distinctive features of *Steele's Chemistry* were the brevity and the abundance of every-day applications. Claiming no originality, he stated that his contribution was "simple, interesting language." Large type, familiar applications, short, declarative sentences, and the absence of abstract theory made the book more inviting to typical students. Its wide success was testimony to Steele's desire for "a pleasant study which the pupil can master in a single [14 week] term" (5).

The book was divided into four sections: (I) A brief Introduction; (II) Inorganic Chemistry, covering the more common non-metals and metals; (III) Organic Chemistry; (IV) An Appendix with experiments, review questions, and a qualitative analysis scheme. The "Inorganic Chemistry" section, covering over half the pages, was a descriptive treatment of each successive element following the common outline: sources; preparation; properties; uses; compounds.

Steele's emphasis on applying chemistry to every-day life may be seen in special paragraphs on photography, matches, glass, ceramics, mirrors, etc. Some of his historical anecdotes are still a delight to read: the term "carat" was derived from a dried bean used for weighing by diamond merchants in India; "crucibles" were so named from the sign of the cross placed on them by the alchemists as a prayer for a safe, non-explosive experiment; "antimony" came from "anti-monk," which 15th-century monk, Basil Valentine, called his newly discovered metal. To test its properties, he fed it to the monastery pigs and found that they thrived upon it. A

similar experiment on his fellow monks caused some to die—hence "anti-monk"; "cobalt" was named by miners for Kobolt, the evil spirit of the mines, because the promising ore crumbled to ashes upon roasting (6). A devout Methodist, Steele also inserted frequent references to a benevolent Creator providing chemicals that man would be able to use.

The appendix on "Directions for Experiments" gave detailed instructions for performing experiments described in the text. In the back of all editions, the publisher advertised sets of chemicals and apparatus. A basic set cost $15.00 and an enlarged set $30.00. Prior to 1873 the sets cost $20.00 and $40.00, but, in addition, special apparatus was offered for making oxygen ($22.50), nitrous oxide ($22.50) and an oxygen-hydrogen blowpipe ($40.00).

The first edition of Steele's chemistry, published in 1867, was titled *A Fourteen Weeks Course in Chemistry* (261 pp, 25 figures). A reprint in 1871 shortened the title to *Fourteen Weeks in Chemistry*. A revised edition in 1873 (312 pp, 78 figures, $1.50) adopted the new nomenclature that was appearing in all texts of the period, though the older version, "with the Old Nomenclature," continued to be reprinted and was advertised as available as late as 1880. The 1873 edition also added a section to the appendix, "Qualitative Analysis for Beginners" by Edward J. Hallock (1846-1884), of Columbia College. In his autobiography, Steele explained that specialists in the various subjects had assisted him in his writings (7):

> In getting up these various books we spared neither labor or expense . . . I associated with myself also the best help I could find . . . In chemistry I was aided greatly by Edward J. Hallock of Columbia College, whose lengthy studies in German laboratories had furnished him with a fund of experience.

It is unclear what contributions Hallock made in addition to his appendix on qualitative analysis. The "New Nomenclature" edition, with an 1873 copyright date, went through many printings with no date on the title page and continued to be used even after a third edition appeared in 1887 (8).

The third edition, copyrighted in 1887, changed the title to *A Popular Chemistry* (327 pp, 81 figures). It was printed in larger type and the introduction and chapters on organic chemistry were rewritten. Steele had died in 1886 and his eyesight had been failing for several previous years. In 1885 he wrote of trying to "get my Chemistry and Physics revised before they [eyes] fail entirely" (9). Apparently he was unsuccessful, since the preface of *A Popular Chemistry* was titled "Publishers Preface" and lacked the "author" comments of previous editions. A contemporary review observed that "the revision has been done by competent hands," but whose hands remains a mystery (10). Hallock's appendix on qualitative analysis was still present, this time with "Ph.D." after his name, but since Hallock had died in 1884, he could not have made the revisions. Another possibility is Mrs. Steele, who was said to have revised some of the books.

*A Popular Chemistry* was reprinted for many years with no date on the title page and the same 1887 copyright date. About 1890, the American Book Company was formed from A. S. Barnes and several other publishing houses. American Book Company continued to publish *A Popular Chemistry* with the same plates that Barnes had used. In 1895, Steele's wife re-copyrighted his 1873 second edition of *Fourteen Weeks in Chemistry* and put it on the market. Perhaps she was no longer receiving royalties from *Popular Chemistry*.

Steele's other texts were equally successful. Immediately after his first chemistry in 1867, A. S. Barnes proposed additional works in science. The *Fourteen Weeks* series was widely used. Steele continued both to teach and write until 1872, when he reluctantly left the classroom to devote his time exclusively to the preparation of textbooks. In collaboration with his wife, Steele also wrote a series of history texts. To avoid any criticism of his reputation in science, he refused to let his name appear on the history works. Later it was inserted on the title page after they were selling in extremely large figures.

**First Edition**—*A Fourteen Weeks Course in Chemistry*

1867 A. S. Barnes; 261 p.; c1867.

1868–71 A. S. Barnes; 288p.; appendices added to previous; c1867.

**First Edition**—*Fourteen Weeks in Chemistry*

1871–79 A. S. Barnes; same contents as previous; 288 p.; c1868; ads for this edition continued in 1873-1879 editions below.

**Second Edition**—*Fourteen Weeks in Chemistry*—(all c1873)—about 25% rewritten.

1873–76 A. S. Barnes; 312 p.; dates on title page.

<1879 A. S. Barnes; 312 p.; no date on title page; Steele's *Botany* (1879) not in ad.

>1879 A. S. Barnes; 312 p.; no date on title page; Steele's *Botany* (1879) is in ad.

>1887 A. S. Barnes; 310 p.; no date on title page; Steele's *Popular Chem.* (1887) is in ad.

~1890 Same as previous except American Book Co.

>1895 Same as previous except c1895 by Mrs. Steele.

**Third Edition**—*A Popular Chemistry*—(all c1887)—no dates on title pages. (About 50% rewritten).

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| 1887–90 | A. S. Barnes; 329 p. |
| –1890 | American Book Co. from press of A. S. Barnes; 329 p. |
| 1890–97+ | American Book Co.; 329 p. |

Although his books were quite simple, Steele struggled with their production. He read every available work on each subject and agonized over the best way to condense the material. He remarked about one of his history books that he had "spent six months in sandpapering the manuscript" (11), and regarding his 1873 chemistry revision, he wrote (12):

> My brain turns out its best product one when driven at high pressure, day after day. If I take things easy my sentences are dull, heavy and cumbersome. Only when my whole nervous system is on fire do my sentences sparkle and my style become lively and entertaining. Every paragraph, therefore, worth keeping or that at all satisfies me, takes just so much of my life force, and exhausts me to that extent. A good sentence consumes something which meat and drink do not promptly supply . . . Then there is a vast amount of study in connection with my book work. Perfection comes from labor, and I expend much of it on my books. But I never grudge any pains or time given to revising, polishing, or verifying. It may sometimes seem of little account, yet it goes to make up the value of my books.

An honorary Ph.D. was conferred upon Steele in 1870 by the University of the State of New York. While none of his biographies mention another degree, his earlier books list "A.M." after his name. He was elected a Fellow of the Geological Society of London and a trustee of Syracuse University.

Steele was in frail health in his later years. He died on 25 May 1886 at Elmira, NY at the age of 50. A deeply religious man, he frequently referred to Divine creation in his science books and endowed a chair of "Theistic Science" at Syracuse University. His beloved wife, Esther Baker Steele, directed that his gravestone read: His true monument stands in the hearts of thousands of American youth, led by him to "look through Nature up to Nature's God." Mrs. Steele also contributed to the "Steele Memorial Library" in Elmira and the "Esther Baker Steele Hall of Physics" at Syracuse University.

## REFERENCES AND NOTES


1. F. W. Clarke, *A Report on the Teaching of Chemistry and Physics in the United States*, Circulars of the Bureau of Education, No. 6, 1880, Washington, DC, 1881, pp. 170-175.
2. Mrs. George Archibald (pseudonym of Anna C. Palmer), *Joel Dorman Steele. Teacher and Author*, Barnes, New York, NY, 1900, pp. 190-215.
3. Reference 2 is the best biography of Steele. It not only contains a short autobiography by Steele himself, but reprints some of his addresses and correspondence. Other biographies are found in W. Miles, *American Chemists and Chemical Engineers*, American Chemical Society, Washington, DC, 1976, p. 454; D. Malone, Ed., *Dictionary of American Biography*, Scribner's, New York, NY, 1935-6, Vol. IX, Part 1, p. 556; *The National Encyclopedia of American Biography*, White, New York, NY, 1893, Vol. III, p. 265; J. Wilson, Ed., *Appleton's Encyclopedia of American Biography*, Appleton, New York, NY, 1888, Vol. V, p. 660.
4. Reference 2, p. xxxi.
5. J. D. Steele, *Fourteen Weeks in Chemistry*, Barnes, New York, NY, 1876, pp. vii and viii.
6. Reference 5, pp. 65, 77, 173, and 123.
7. Reference 2, p. xxxii. Little-known chemist Edward John Hallock was born in Peekskill, N Y in 1846. He received an A.B. degree in 1869 and an A.M. in 1872 from Columbia College School of Mines. He worked at the same school from 1871 to 1877 as Assistant in General Chemistry under Charles F. Chandler. He was among those attending the Joseph Priestley Centennial at Northumberland, PA in 1874. From 1872 to 1884, he wrote extensively in the *Boston Journal of Chemistry*. Hallock's "Qualitative Analysis for Beginners," which Steele appended to his text in 1873, was also serialized in the *Boston Journal of Chemistry* (Volumes 7 & 8, 1872-73). While studying in Europe in 1877-79, he sent frequent letters to this journal. He was awarded the Ph.D. at Heidelberg in 1878. He was Professor of Chemistry at Southern Medical College, Atlanta, GA in 1880-81 and was appointed Director of the Analytical Laboratory of the *Boston Journal of Chemistry* in 1881. He also contributed articles to *Popular Science Monthly* and other periodicals. He died 22 March 1884. (Biographical information from *Boston J. Chem.*, **1877**, *12*, 68-69, 172, 208-209; **1879**, *13*, 28, 40-41; **1880**, *14*, 28-29; **1881**, *15*, 7; **1884**, *18*, 71).
8. Around 1880 the appendix of the 1873 copyrighted, "New Nomenclature" edition was revised. Although the total number of pages remained unchanged, the "Qualitative Analysis" section was shortened and the "Directions for Experiments" section was enlarged and reset in smaller type.
9. Reference 2, p. 161.
10. "Book Reviews," *Science*, **1888**, *12*, 107.
11. Reference 2, p. 160.
12. Reference 2, p. 155-156.
13. This portrait of Steele was used as a frontispiece in all printings of his *A Popular Chemistry*.