

7 Alchemy, Metallurgy, and Pharmacy: Edgar Fahs Smith and the History of Chemistry

Lynne Farrington

I have become a real enthusiast in regard to the history of chemistry, particularly the history of chemistry in America. At times I dream of the occurrences which took place in the rise of our science in this country, and not infrequently catch myself sketching, in imagination, some of those occurrences on the wall spaces of my office and my laboratory. I feel quite certain that could I wield the artist's brush after the manner of the immortal Benjamin West, or even moderately well, I would attempt to make my pictures of imagination real pictures, portraying in oil some of the landmarks in the development of our science here at home.

Edgar Fahs Smith¹

On the Penn campus is a statue of former University of Pennsylvania Provost Edgar Fahs Smith,² gazing down at the passing throngs of students on their way to classes and laboratories. Like his collection, this statue, currently on the walkway near the new Roy and Diane Vagelos Laboratories of the Institute for the Advancement of Science and Technology, has moved many times,³ yet it remains an important part of Penn's past, present, and its future.

EDGAR FAHS SMITH, Professor of Chemistry and Provost of the University of Pennsylvania, was born to Gibson and Susan Elizabeth (Fahs) Smith at King's Mill in West Manchester Township, near York, Pennsylvania, on May 23, 1854. His father was a prosperous grain, wood, and coal merchant in York who died suddenly of pneumonia in middle age, leaving the family in comfortable circumstances. His mother was a devout Moravian to whom Smith credited much of his success. His brother, Allen John, born in 1863, would follow Smith in a flourishing career of his own, as a physician, author, and educator. Allen John Smith was Professor of Pathology in the Medical School at the University of Pennsylvania from 1903 until his death in 1926, and served as the Dean of the Medical Faculty from 1909 to 1912.

While Edgar Fahs Smith's early training was in classical languages and literature at the academically rigorous York County

¹ From "A Chapter in Historical Chemistry," an address delivered at the College of the City of New York, March, 1922, and reprinted in the Edgar Fahs Smith Memorial Number of the *Journal of Chemical Education* 9:4 (April 1932) p. 635-642.

² The statue was the work of R. Tait McKenzie, Professor of Medicine and Director of Physical Education at the University of Pennsylvania from 1904 to 1931. It is one of many sculptures by McKenzie displayed on the Penn campus.

³ Originally near the John Harrison Laboratory of Chemistry, where Smith had his office, and later near Smith Hall, which was recently torn down to make way for the new Vagelos Laboratories. The statue was erected in 1925 and dedicated on June 12, 1926, while Smith was still alive. According to Smith's secretary and the first curator of the collection, Eva Armstrong, it was a source of acute embarrassment to Smith, so much so that he would go the long way to Harrison Laboratory rather than pass it on what had been, until then, his usual route.

Opposite page. Edgar Fahs Smith in front of his statue, 1927. Gift of Mel Gorman. Smith Collection.



EDGAR FAHS SMITH

PROVOST

1911-1920

TEACHER INVESTIGATOR FRIEND

Academy, science—and specifically chemistry—beckoned him. Almost as a preview of his future endeavors, Smith's youthful publication, *Our Effort*,⁴ announced as its stated purpose “[to] aid as much as possible in the forwarding of science, the love of which has incited us to such an important undertaking, and which has, does and ever will contribute to the happiness of man.”⁵

Though Smith originally planned to attend Yale College, he enrolled at Pennsylvania College⁶ in 1872 and took a Bachelor of Science degree in 1874, majoring in chemistry and mineralogy. Smith's chemistry professor, Samuel P. Sadtler, encouraged him to go abroad and study at the University of Göttingen with Friedrich Wöhler, whose work laid the foundation for modern organic chemistry. Smith received the Masters of Arts and the Doctor of Philosophy degrees from Göttingen in 1876.

Returning to Pennsylvania, Smith married Margie Alice Gruel, whom he had met while a student at Pennsylvania College. The couple, whose marriage appears to have been one of mutual respect, understanding, and affection, had no children. Apart from a short period of teaching at Muhlenberg College (1881–1883) in Allentown, Pennsylvania, and Wittenberg College (1883–1888), in Springfield, Ohio, he spent his entire career at the University of Pennsylvania. Smith died in Philadelphia on May 3, 1928.

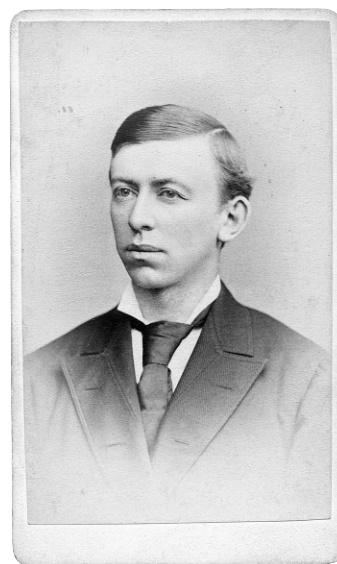
AT PENN, Smith was initially appointed an instructor in chemistry (1876–1881). In 1888 he returned to Penn as Professor of Chemistry and in 1892 became chairman of the Chemistry Department. He served as Vice-Provost of the University from 1898–1911 and as Provost⁷ from 1911–1920. During his tenure as Provost, he continued to teach and write. Smith's years as Provost were marked by a doubling of both the student body and the teaching staff of the University, and by the division of the College into specific schools.

Characterized by a simple and generous spirit, Smith showed little interest in material goods or status. Even after the University purchased a residence for the Provost, Smith refused to move into it, to the chagrin of the Trustees. He preferred his small housekeeping apartment in the “Avondale,” a few blocks from his office. Although the recipient of numerous awards and honorary degrees, he never let them distract him from his primary interests and goals. While Provost, he regularly made financial contributions to the University, returning part of his salary and sometimes even purchasing whatever was urgently needed, whenever his

⁴ A bound copy of the complete run of *Our Effort* can be found in the Edgar Fahs Smith Papers (Ms. Collection 112), Rare Book and Manuscript Library.

⁵ *Ibid.*, 1:1 (July 1881) p. 15.

⁶ Now known as Gettysburg College.



Edgar Fahs Smith “when he first came to the University of Pennsylvania.” Photograph by Broadbent & Phillips, Philadelphia. Smith Collection.

⁷ The highest office in the University at that time, the Provost was the equivalent of today's President.

own funds sufficed. In 1922 Smith was urged by numerous politicians to accept the Republican nomination for the Governorship of Pennsylvania. He declined the nomination because he knew from his friendships with former governors that the life of the governor was a "terrible one," since "it was impossible for a governor to keep his promises with all factions."⁸

Smith seems regularly to have worked far into the night, long after his administrative duties were finished. He knew his students well and took a paternal interest in them, remembering their first names long after they had graduated. As a public speaker he was not only interesting and enjoyable, but also direct and to the point, so much so that Horace Howard Furness,⁹ the well-known Shakespearean scholar and renowned orator, once described him as a "master of concise expression."

Smith was also a deeply religious man, though he showed little interest in sectarian religious expression and does not appear to have belonged to a particular church. He was raised in the Moravian faith, which emphasized deeds over beliefs, and this orientation guided him. According to colleagues, he kept in the drawer of his desk a Bible, a copy of "Daily Prayers for Moravian Households," and the annual Moravian manual of daily texts, all of which he is said to have read from daily. While Vice-Provost and Provost he found time in his busy schedule to conduct short "chapel" services daily at noon in Houston Hall for those interested in attending.

Professionally, Smith was prolific. He was the author of some two hundred and fifty publications, more than half of which were contributions to the field of chemistry. And while Smith was not a great research chemist, he played a significant role in nurturing young chemists, participating in scientific organizations, conducting original research, and generally advancing the cause of science in this country.

More important than any particular contribution to the field of chemistry were Smith's contributions to "the history of chemistry, particularly the history of chemistry in America." He published numerous articles, pamphlets, and books on earlier American chemists, including Joseph Priestley,¹⁰ Robert Hare,¹¹ and James Woodhouse.¹² He also wrote on a range of historical topics, including histories of chemistry in Philadelphia and America, respectively,¹³ and an examination of old chemistry books entitled *Old Chemistries*.¹⁴ Thus, the books, manuscripts, and images in Smith's collection were essential to his research, providing him with the primary materials needed to write and illustrate these texts.

⁸ Charles A. Browne, "Reminiscences of Professor Edgar Fahs Smith," bound typescript (1933), p. 28.

⁹ The Horace Howard Furness Shakespeare Collection is also part of the Rare Book and Manuscript Library.

¹⁰ *Priestley in America, 1794-1804* (Philadelphia: P. Blakiston's Son, c1920). Joseph Priestley (1733-1804) spent his last decade in Northumberland, Pennsylvania, making occasional trips to Philadelphia. His house in Northumberland is now a museum.

¹¹ *The Life of Robert Hare, An American Chemist (1781-1858)* (Philadelphia: J.B. Lippincott, 1917). Hare taught at the University of Pennsylvania from 1818 to 1847. See Martin Meyerson and Dilys Pegler Winegrad, *Gladly Learn and Gladly Teach* (Philadelphia: University of Pennsylvania, 1978) for its discussion of the importance of the science curriculum in the development of the University.

¹² *James Woodhouse: A Pioneer in Chemistry (1770-1809)* (Philadelphia: John C. Winston, 1918). Woodhouse was elected Professor of Chemistry at the University of Pennsylvania in 1795.

History of the Collection

THE COLLECTION, now known as the Edgar Fahs Smith Memorial Collection in the History of Chemistry, was officially presented to the University of Pennsylvania by his widow, in 1931.¹⁵ Smith's former offices in the Harrison Laboratory served as the first home for what was a veritable museum of chemical history.

The history of the Smith Collection, however, predates this event by some forty years. In 1921 Smith recounted the origins of his interest in the history of chemistry, and in collecting older works related to it:

My interest in the history of chemistry began more than 30 years ago ... as a student, the time honored volumes on the history of chemistry had been dutifully read by me, but with shame I confess that over many of these volumes I fell fast asleep. Yet when the life story of the makers of our science came to me, then quite a different attitude towards its history was awakened in me ... I took to visiting out of the way second hand book-shops—usually on Saturday afternoons, picking up here and there a stray volume devoted to chemistry.¹⁶

He employed this approach with his students as well, sharing portions of his collections with them. Smith told his friend and fellow chemist Charles A. Browne:

... to arouse an interest in the early chemists among his students he would often call one of them into his library and showing him an old letter of Priestley, Davy or some other famous investigator ask him to pass his hand over the face of the letter and then impress upon the student the fact that his hand was now touching the very paper where Priestley's or Davy's hand once rested.¹⁷

Over time, Smith assembled a truly outstanding library on the history of chemistry. Chemists and scientists of his day, having heard of Smith's collection, traveled to Philadelphia to see some of its treasures. In fact, during the 1926 meeting of the American Chemical Society in Philadelphia, Gabriel Bertrand, Pasteur's successor at the Pasteur Institute, made his way to Smith's office to see some of the manuscripts he had tried to buy, but in

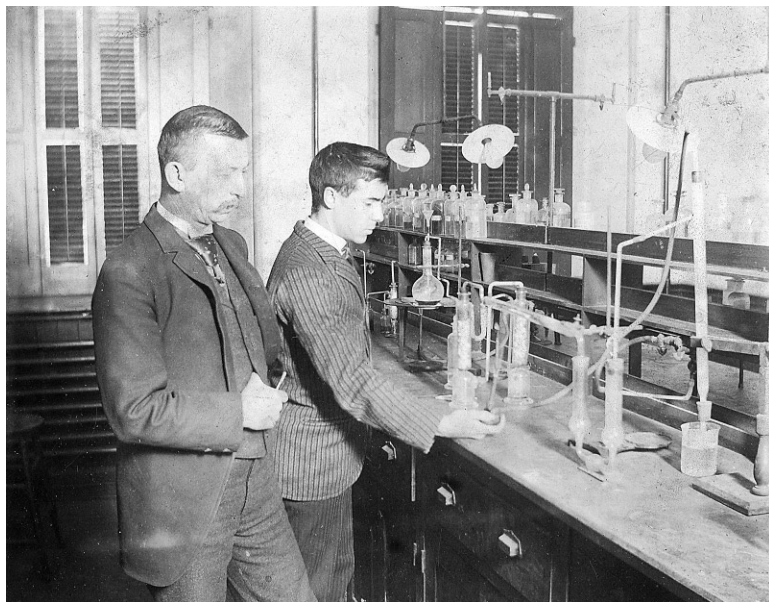
¹³ *Chemistry in Old Philadelphia* (Philadelphia: J.B. Lippincott, 1919) and *Chemistry in America: Chapters From the History of Science in the United States* (New York: D. Appleton, 1914).

¹⁴ New York and London: McGraw-Hill, 1927.

¹⁵ The collection was first open for use in 1929, with Smith's secretary, Eva Armstrong, as Curator.

¹⁶ "Observations on Teaching the History of Chemistry," *Journal of Chemical Education* 2:8 (July 1925) p. 533.

¹⁷ "Reminiscences of Professor Edgar Fahs Smith," "p. 2.



Edgar Fahs Smith and his student, Philip Maas, working on the atomic weight of molybdenum in the chemical laboratory on the first floor of College Hall, 1893. Gift of O. S. Shinn. Smith Collection.

whose acquisition he had been thwarted by “Monsieur Smith of Philadelphia.”

Smith viewed chemistry as a “human science,” precisely because “[i]t comes closest to hearth and home. In every employment we feel its influence or want its aid.”¹⁸ His collection reflects this viewpoint. There are books on pyrotechnics and books on distillation, on dyes and yeast, on alchemy and gaslights, on pharmacy and brewing. The range of material, all falling under the rubric of chemistry, reflects the various ways in which mankind has used chemistry to transform the world for its own use.

Upon Smith's retirement in 1920, the University Trustees invited him to retain his University rooms, which he did, continuing to use them as the base for his numerous research and writing projects. It was during this period that he greatly enlarged his collection. Smith was, naturally, concerned with the fate of his collection, and according to his former secretary, Eva Armstrong, when he was

browsing in the library one day, touching his books lovingly here and there, he said: “I wonder what will become of my treasures when I am gone.” He dreaded to think that material so valuable to chemistry might be scattered to the winds or buried in the dark recesses of a general library.¹⁹

After his death in 1928, Smith's office was shut up and the future of the collection was uncertain. It was the commitment

¹⁸ Eva V. Armstrong, *Playground of a Scientist* (Philadelphia, 1949), p. 19.

¹⁹ Eva V. Armstrong, *The Story of the Edgar Fahs Smith Memorial Collection in the History of Chemistry* (Philadelphia: University of Pennsylvania, 1937), p. 8.



Edgar Fahs Smith in his office in Harrison Laboratory, taken on the day of his investiture as Provost of the University of Pennsylvania, January 1, 1911. Photograph by Walter Rogers. Smith Collection.

of his wife, whose real interest was not in chemistry but in a particular chemist, that decided its fate. As a result of her foresight, Smith's complete collection of over 5,000 items relating to the history of chemistry was presented to the University of Pennsylvania by Mrs. Smith as a living memorial to her husband. She also generously endowed the collection, which she named The Edgar Fahs Smith Memorial Collection. In recognition of her contribution to the Collection, Mrs. Smith was appointed Honorary Curator by the University.

THANKS TO THE ENDOWMENT started by Mrs. Smith, augmented by later donations, and to numerous gifts of books, manuscripts, engravings, etc., the depth and breadth of the collection has increased greatly. From the approximately 3,000 printed volumes and 600 manuscripts that constituted Smith's original library, the Collection has grown to nearly 15,000 printed books, bound manuscripts, and pamphlets, as well as more than 100 linear feet of loose manuscripts, including Smith's own papers.²⁰ It also includes an important collection of ca. 4,000 photographs and engravings of scientists and alchemists, chemical apparatus, and laboratories, of which 1,800 were collected by Smith himself, and which was supplemented by a small cache of medals. Finally, there are a number of original chemical apparatus that were part of Smith's own collection.

There have been a number of notable additions to the Collec-

²⁰ Smith's papers, including his unpublished memoir, are available as Ms. Collection 112 in the Rare Book and Manuscript Library.

tion over the years by colleagues and associates of Smith. Among them was a portion of the library of Walter T. Taggart, a colleague at Penn. In 1945, Charles A. Browne of the U.S. Bureau of Chemistry and Soils, an early President of the History of Science Society and an authority on the history of agricultural chemistry, gave approximately 450 books, manuscripts, and prints in memory of his parents. Browne had been interested in the growth and development of the Collection since its inception, and he had used its resources frequently. Another notable acquisition, especially strong in works on pyrotechnics and Oriental alchemy, was the library of Tenney L. Davis, an organic chemist at MIT. Davis was an authority on the chemistry of explosives and a student of Chinese alchemy, and his books became part of the Collection shortly after his untimely death in 1949.

During the 1930s and 1940s, the Collection continued to expand at a rapid pace, eventually outgrowing its space. While originally belonging to the Chemistry Department, responsibility for the Smith Collection changed in 1950, with the transfer of the Smith endowment funds from the Towne Scientific School to the University Library. The position of Curator, on the other hand, remained independent of the Library until 1987. From 1929 through 1954, the Smith Collection was housed in Smith's former office in the John Harrison Laboratory²¹ at 34th and Spruce. During the summer of 1954, however, the office, including all the treasures contained therein, was packed away in crates, to make room for the office of the new chairman of the Chemistry Department.

The future of the collection was uncertain, due at least in part to a deficit in the Smith Collection endowment. The Collection, along with recent donations to the Library, was to be moved to the fourth floor of the Hare Building, home of the chemical laboratories for the Medical, Dental, and Veterinary Schools, at 36th and Spruce. The move was controversial and led to the resignation of the Curator. Letters of protest were received from individuals and institutions. As soon became clear, not only was the Collection to be moved, but the position of Curator was to be eliminated, and access to its holdings would be by appointment only. In response to this, an article on the move and an editorial criticizing the University's treatment of the Collection, appeared in *The Daily Pennsylvanian*.²²

Protests against these policies brought about a reprieve. The process of moving the collection, though, took about a year to complete, and during this hiatus there was no access to the collection. The Collection was housed in 420 Hare from June 1956 until 1967,

²¹ The Harrison Laboratory was torn down in 1970 to make room for a modern chemistry facility.

²² "Chemists Criticize Limiting E. F. Smith Library Service," and editorial, "The Shame of Pennsylvania: The E. F. Smith Library." *The Daily Pennsylvanian* 68:21 (October 26, 1954).

when it moved into its current home on the sixth floor of the Van Pelt-Dietrich Library Center.

While President of the American Chemical Society in 1921 and 1922, Smith was instrumental in founding the division of History of Chemistry. He also sought to establish a journal dedicated to research on the history of chemistry, but was unsuccessful in raising the money necessary to endow such a publication. This dream of Smith's, however, was kept alive by Eva Armstrong, who served as the first Curator of the Collection.²³ When an advisory committee was appointed to expand the activities of the Collection in the mid-1940's, it proposed publishing an annual volume, international in character, dedicated to history of chemistry. *Chymia: Annual Studies in the History of Chemistry*²⁴ first appeared in 1948, and until 1967 it was published by the University of Pennsylvania Press under the auspices of the Smith Collection.

In the late 1970s and early 1980s, Smith Curator and Penn Professor in the Department of History and Sociology of Science, Arnold Thackray, worked with others to establish the Center for the History of Chemistry. The original home for the Center, of which Thackray has been director since its inception, was the Smith Collection, where it was located from 1982-1987. As the Center grew both physically and programmatically, it exhausted its space in the suite of rooms housing the Smith Collection. In late 1987 the Center moved to 3401 Walnut, at which time it was renamed the Arnold and Mabel Beckman Center for the History of Chemistry. More recently it has acquired its own building at 315 Chestnut Street. Ongoing contact between the Beckman Center, now part of the Chemical Heritage Foundation, and the Smith Collection continues a long and fruitful relationship.

The Smith Collection remains an active and growing collection, used by a wide variety of patrons in a multitude of ways, for classes and presentations, exhibitions and loans to other institutions. New acquisitions are regularly made of older materials on chemistry and its historical predecessors, with funding from the two Smith Collection endowments, for which we are grateful to the generous foresight of Mrs. Smith.

For many years now the image portion of the Collection has served as a major resource for scholars and publishers in search of images with which to illustrate their works. Since 1997 the Annenberg Rare Book & Manuscript Library, home of the Smith Collection, has been working with the Schoenberg Center for Electronic Text & Image (SCETI) on a web site dedicated to images of chemists and alchemists, laboratories and apparatus.

²³ The Curators of the Smith Collection, in order:

Eva Armstrong, 1929-1949

Robert Sutton, 1949-1954

Dr. Claude K. Deischer,
1955-1969

Dr. Arnold Thackray, 1969-1987

Christine Ruggieri, 1987-1992

Dr. Michael Ryan, 1992-

²⁴ Charles A. Browne served as the Editor-in-Chief of *Chymia* during its infancy, until his death on February 3, 1947. Tenney L. Davis replaced Browne, serving as Editor-in-Chief for volumes I and II, until his own death in 1949.

This web site (<http://www.library.upenn.edu/etext/collections/smith/>) serves as an important element of outreach to the wider chemical and scientific communities, and has greatly enhanced the visibility of the Collection.

Finally, in recognition of the importance of the Smith Collection to the world of chemistry, the Collection was designated a National Historic Chemical Landmark by the American Chemical Society in a ceremony on March 16, 2000 in the Smith Room.

Scope of the Collection

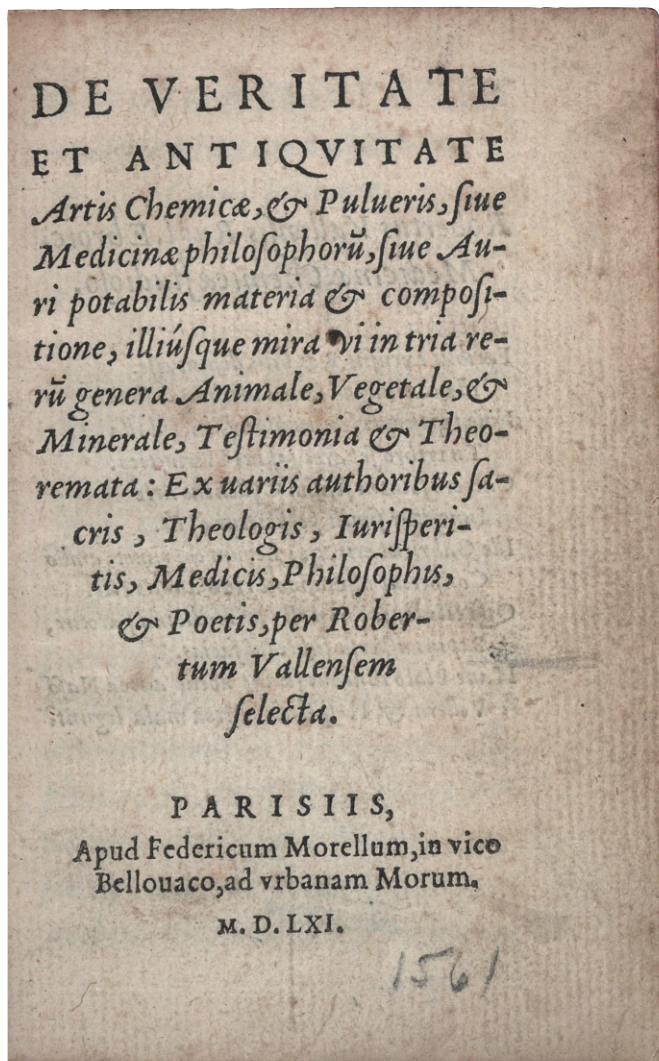
BEFORE IT DEVELOPED into a separate discipline, chemistry was the domain of physicists, naturalists, and physicians, as well as alchemists and metallurgists. In collecting works relating to chemistry, Smith cast a wide net, acquiring materials regarded by some as marginal to the field as it was then understood. Not only the classics of chemistry, but ancillary materials as well, found their way into the Collection, and rightly so, for all played a role in the development of chemistry.

While there are a number of early manuscripts in the Collection, mostly having to do with alchemy, the earliest printed work is a copy of the 1480 edition of Thomas Aquinas's commentary on Aristotle, *Commentaria super libros physicorum*. Other early works include the first edition of the first history of chemistry, *De veritate et antiquitate artis chemicae* by Robert Vallensis, published in Paris in 1561, and the first edition of the earliest published work specifically on American metallurgy, *Arte de los metales* by Alvaro Alonso Barba, written in Bolivia, published in 1640 in Madrid, and said to have been banned and burned by the Inquisition.

In the interest of documenting all aspects of the history of chemistry, Smith assembled a great deal of material relating to alchemy and its practitioners. In fact, he was quite diligent in his pursuit of such works. Shortly after purchasing an autograph of the German alchemist, Henry Cornelius Agrippa (1486–1535), Smith received a radiogram from a Swedish collector, a Dr. Waller, who offered to buy the autograph at twice the price. Smith refused the offer, as well as a number of subsequent offers of chemistry manuscripts, until some rare manuscripts of the Swedish chemists Berzelius, Mosander, and Seftstrom, which arrived in the mail, proved too great a temptation.²⁵

Among the many alchemical manuscripts Smith acquired is an

²⁵ Eva Armstrong, "Some Treasures in the Edgar Fahs Smith Memorial Collection," *General Magazine and Historical Chronicle* 25:4 (July 1933) p. 516–517.



Robertus Vallensis, *De veritate et antiquitate artis chemicae*. Paris: Federicum Morellum, 1561. Gift of Walter Taggart. Smith Collection.

English translation of Alexander von Suchten's *De secretis antimonii* that contains annotations in the hand of John Winthrop, the first Governor of Connecticut. In 1631 Winthrop brought with him from England a number of books on chemistry and alchemy, perhaps the earliest chemical library in America, and continued to add to his collection until his death in 1676. Printed works on alchemy include the 1545 edition of *Alchemiae*, attributed to the eighth-century Arab physician Jābir ibn Hayyān, but more likely belonging to a group of Latin alchemical writings which appeared in the thirteenth and fourteenth centuries under the name Geber, which was thought to be identical with Jābir. The poet Samuel



Illustration from Elias Ashmole, *Theatrum chemicum britannicum*. London: J. Grismond for Nathaniel Brooke, 1652. Smith Collection.

Taylor Coleridge, an aficionado of alchemical lore, left his autograph in a copy of the 1718 edition of Barchusen's *Elementa chimiae*. And a copy of Ashmole's (1617–1692) *Theatrum chemicum britannicum* (1652) was one of a group of rare books presented to Smith by some friends of his at Columbia University. It consists of a compilation of old English poems on alchemy made by Elias Ashmole, founder of the Ashmolean Library at Oxford University. This copy was part of the library of Sir Isaac Newton and contains his bookplate and annotations.

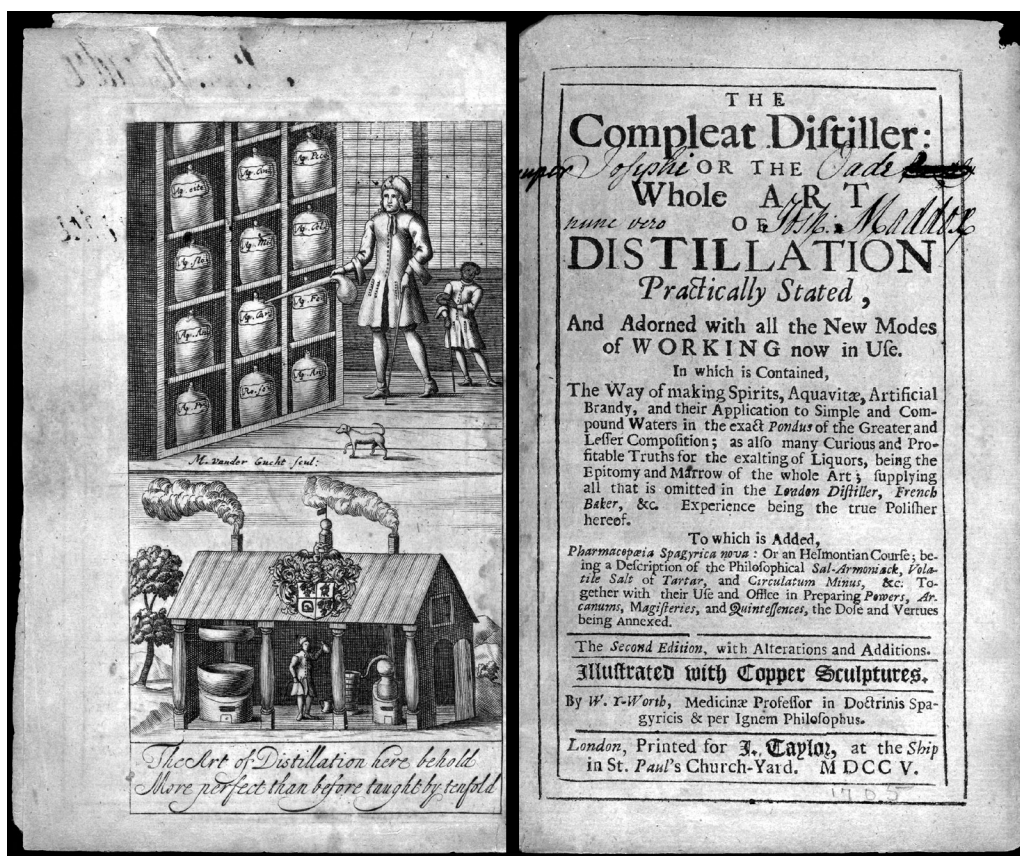
Distillation, the oldest method for producing chemically pure substances, originated in antiquity, where it was used to manufacture perfumes and alcohol and to purify water. In their quest to transform base metals into gold, alchemists developed a type of distillation apparatus called an alembic. William Y-Worth's *The*

Compleat Distiller (1705) contains various illustrations of such devices. Distillation had many practical uses beyond those recognized by the ancients, and the Collection holds many works on pharmacology, including numerous books full of recipes for various concoctions and potions. One German manuscript, written in 1683, is a pharmacopoeia, or medical miscellany, containing remedies and treatments for various diseases, probably copied into a single volume for the use of an early physician. There are also works on producing mercury and acids, such as the 1598 edition of Lazarus Ercker's *Beschreibung aller fñnemisten Mineralischen Ertzt unnd Berckwercksarten*, alongside works on making liquors, vinegar, sugar, and soap.

An impressive assemblage of pyrotechnical literature from the library of Tenney L. Davis, acquired in 1950, added another dimension to the Collection. However, Walter Taggart was the source of the Venice, 1550 edition of *Pirotechnia*, by Vannuccio Biringucci (1480-1539?), first published in 1540, which may well be the earliest printed work to mention the subject. It is also important

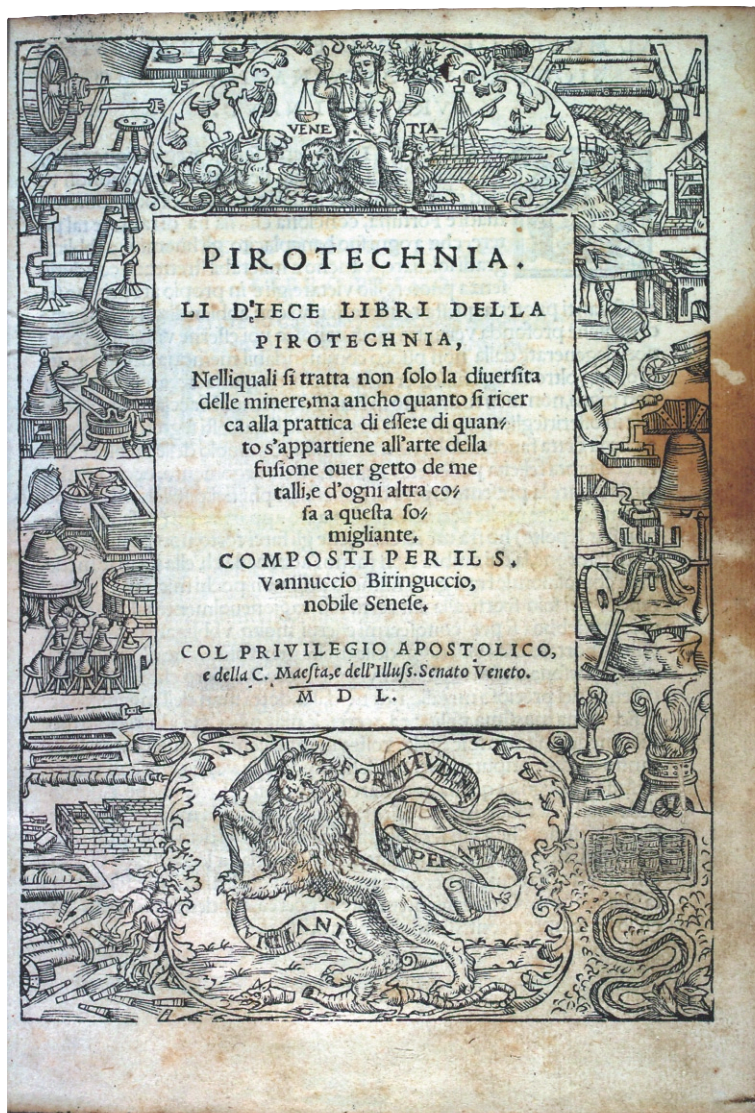
Opposite page: Illustration from "Feuer Buech" (manuscript treatise on munitions and explosive devices). Germany, 1584. Smith Collection.

William Y-Worth, *The Compleat Distiller*. Second edition. London: J. Taylor, 1705. Smith Collection. The apparatus to the right of the figure in the bottom half of the frontispiece is an alembic. The larger figure in the top half is holding a retort, a vessel in which substances are distilled.



Ein Scherbrockstück
vnd Karren Püßen Zeladen





Vannuccio Biringuccio, *Pirotechnia*.
Venice: C. Maesta, 1550. Gift of
Walter Taggart. Smith Collection.

as the first systematic text on mining and metallurgy, anticipating Agricola's *De rei metallica* by sixteen years. The Collection holds both the first English and the first Italian works dedicated solely to the subject of recreational fireworks, John Babington's *Pyrotechnia* (1635) and Giuseppi Alberti's *La pirotechnia* (1749), respectively. At least three manuscripts are concerned with fireworks, including a nineteenth century compendium of chemical formulas for producing fireworks, arranged by color (Ms. Codex 517), and "Feuer Buech," a 1584 German treatise on munitions and explosive devices with thirty-four color illustrations (Ms. Codex 109).



John Babington, *Pyrotechnia, or, A Discourse of Artificiall Fire-Works*. London: Thomas Harper, for Ralph Mab, 1635. Gift of Charles Albert Browne. Smith Collection.

One of Smith's abiding interests was in the history of chemistry in America. Smith's research was likely facilitated by the fact that during the colonial period, Philadelphia was the center of scientific activity in the colonies. The first of the Philadelphia chemical societies, whose name remains unknown, was organized in 1789 and disappeared shortly thereafter, while the celebrated Chemical Society of Philadelphia, founded in 1792, may have lasted until 1810. Along with other works relating to chemistry's early history in this country, the Smith Collection holds a copy of the Society's *Annual Oration Delivered Before the Chemical Society of*

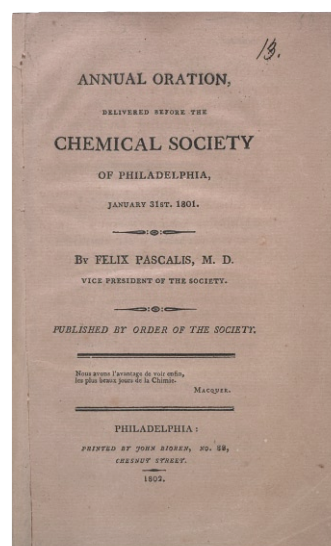
Philadelphia, January 31st, 1801, published in 1802 and reprinted by Smith in his *Chemistry in America* (1914).

As one might imagine at an institution founded by Benjamin Franklin, from early on the College of Philadelphia stressed mathematics and the natural sciences in its curriculum. The Smith Collection contains Peter Shaw's translation of Boerhaave's famous *Elements of Chemistry*, which originally appeared in Latin in 1724. This translation was used as the textbook in the chemistry course given in 1756 at the College of Philadelphia and taught by Provost William Smith.

Originally, chemistry was offered in universities as a service course in medical schools. The first department of medicine in North America was founded in 1765 by Dr. John Morgan at the University of Pennsylvania. While there was no provision for a professor of chemistry on the original faculty of the Medical Department, the faculty recognized the need to teach chemistry, and Morgan took it upon himself to deliver lectures on the subject. In turn, the Medical Department established the first chair of chemistry in 1769. Benjamin Rush, a leading American physician and champion of chemistry, was the first to hold it, serving as Professor of Chemistry from 1769–1789. Manuscript lecture notes by Rush and one of his students can be found in the Collection. While Smith did not possess his own copy of Rush's "Syllabus of a Course of Lectures on Chemistry" (1770), he would have had access to the copy in the University Library.

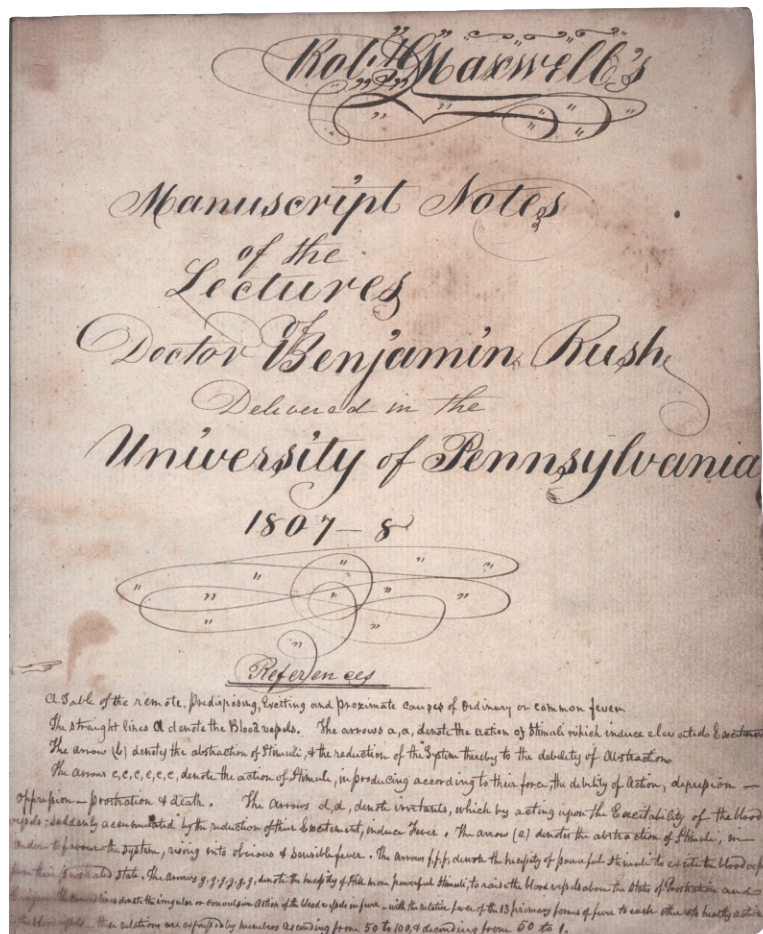
The works of both Robert Boyle (1626–1691) and Joseph Priestley (1743–1794) are well represented in the Collection, with the Boyle imprints comprising the most comprehensive collection of its kind in North America. Boyle, whose best-known work was *The Sceptical Chymist* (1661), is considered one of the founders of modern chemistry. Boyle's Law, which expresses the relationship between the pressure and the volume of air as a mathematical constant, was the first application of mathematics to chemistry.

Priestley, best remembered for his discovery of oxygen, was sympathetic to the French Revolution, and these sympathies forced him to leave his home in Birmingham, England. He went into exile in America, where he continued his work, "giv[ing] inspiration and impetus to a host of young Americans to press forward in chemistry."²⁶ Among the Priestley manuscripts in the Collection are letters written by him to the National Assembly of France accepting citizenship but declining the invitation to join the Assembly. A copy of the law



Felix Pascalis, *Annual Oration Delivered Before the Chemical Society of Philadelphia, January 31st, 1801*. Philadelphia: John Bioren, 1802.

²⁶ Smith, "Progress of Chemistry: Address Delivered Before The American Chemical Society" (September 9, 1921) p. 3.

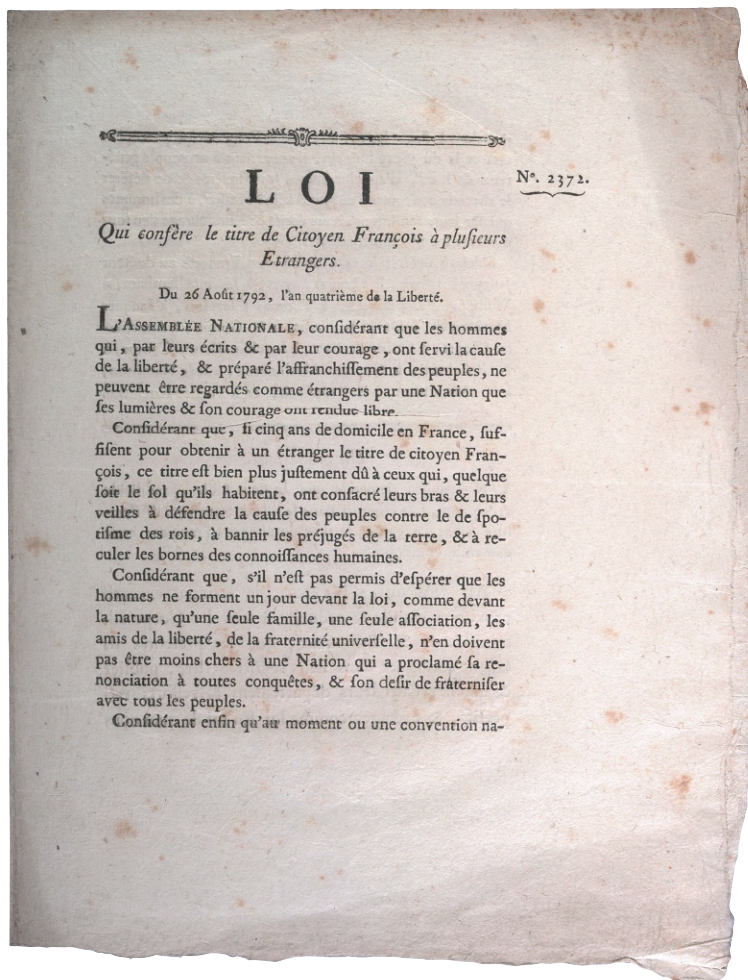


Robert Maxwell, "Manuscript Notes of the Lectures of Doctor Benjamin Rush Delivered in the University of Pennsylvania 1807-8." Smith Collection.

conferring French citizenship upon Priestley and others can be found with the printed Priestley materials.

Smith also collected works on chemistry by women. *I secreti*, an early work on perfumes by Isabella Cortese, is represented by the 1574 edition. *La chimica caritatevole, e facile, in favor delle dame*, written by Marie Meurdrac and published in Venice in 1782, applies chemistry to the production of cosmetics. According to Smith, "one of the most delightful chemical texts which circulated abroad and in America the first half of the nineteenth century"²⁷ was none other than Jane Marcet's *Conversations on Chymistry*. Although Marcet was English, this work was enormously influential in developing interest in chemistry among the young, and more than 160,000 copies were sold in this country before 1853. The Smith Collection holds over thirty copies printed before 1850, in both English and American editions,

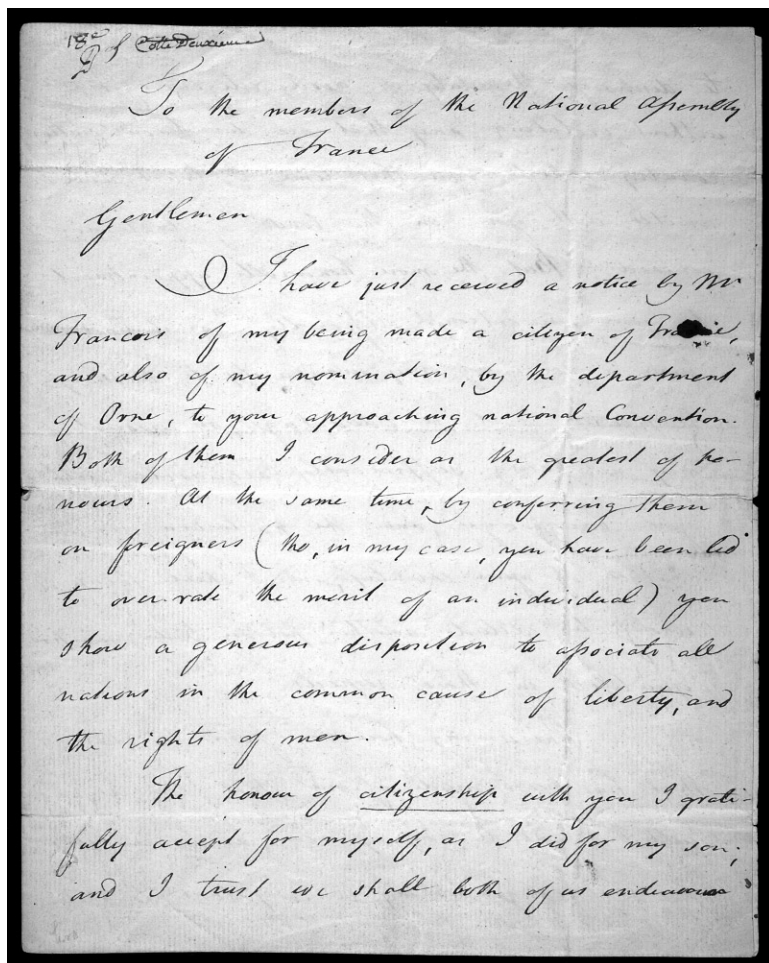
²⁷ *Old Chemistries*, p. 64.



Loi qui confère le titre de Citoyen François à plusieurs Etrangers. Paris: Imprimerie nationale du Louvre, 1792. Smith Collection. Joseph Priestley is one of many foreigners, including Thomas Paine, Jeremy Bentham, and George Washington, who were made French citizens by this law.

including the first American edition (1806). And of course one should not forget the contributions of Madame Lavoisier to her husband's work, most notably in the engravings she made for his *Traité élémentaire de chimie* (1789).

Practical chemistry, that is, the application of chemistry to other fields, is represented by numerous texts in a variety of fields. There are texts on topics ranging from soap-making and bleaching to paints and varnishes. Works on the production of beer and wine also abound. Jean-Antoine-Claude Chaptal's *L'art de faire, gouverner, et perfectionner les vins* (1801) and the popular chemist Friedrich Accum's works, *A Treatise on the Art of Brewing* (1820) and *A Treatise On the Art of Making Wine From Native Fruits* (1820), are just a few of the titles relating to the manufacture of these important beverages. Accum, whose works were often reprinted in American



Autograph letter from Joseph Priestley to the members of the National Assembly of France, September 13, 1792, accepting the honor of French citizenship while declining an appointment to the National Assembly. Smith Collection.

editions immediately after their publication in England,²⁸ was also one of the earliest teachers of American students, among whom was Yale professor of chemistry Benjamin Silliman.

Smith's collection of images of scientists and philosophers, including chemists and alchemists, and of laboratories and apparatus forms a vital part of the larger Smith Collection. Among them are illustrations of Michael Faraday, Robert Hare, Antoine Lavoisier, Joseph Leidy, Justus Liebig, Louis Pasteur, Joseph Priestley, and Friedrich Wöhler.

Various chemical apparatus round out the collection, providing tangible evidence of the ways in which research was done in an earlier period. Probably the most important of these is Robert Hare's "aqueous sliding rod hydro-oxygen eudiometer," an instrument for measuring and analyzing gases, illustrated and described in his *Compendium of the Course of Chemical Instruction*

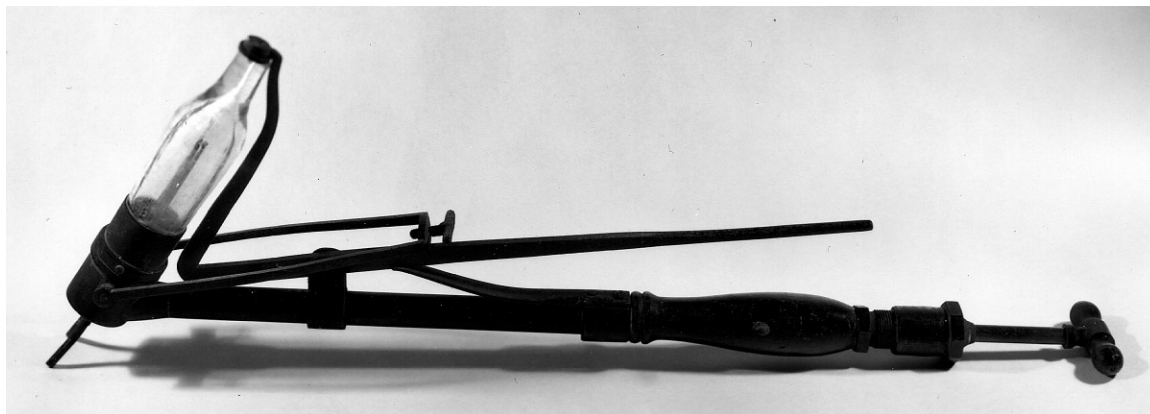
²⁸ In the years before international copyright laws were instituted, American presses were busy re-printing foreign chemical books as soon as they came off the boat.

in the Medical Department of the University of Pennsylvania (1827). Other apparatus include a set of hand-scales with weights, used by Priestley, and a large glass retort and receiver, mounted on metal stands, that had belonged to Charles Ehrenfeld and was presented to the Collection in 1937.

Among recent acquisitions to the collection are *Pharmacologia Anti-empirica, or, A Rational Discourse of Remedies both Chymical and Galenical* (1683), by Walter Harris; *L'Art du Distillateur Liquoriste* (1775), by Jacques-François Demachy; two eighteenth-century medical manuscripts; a small cache of books dealing with animal magnetism; and more than a hundred portraits of scientists and medical doctors.

Frederick Accum, *A Treatise on the Art of Brewing*. London: Longman, Hurst, 1820. Smith Collection.





WITHOUT a doubt, the history of chemistry is indebted to Edgar Fahs Smith for his many contributions to the field, including his publications on historical chemistry, his instrumental work in developing interest in the historical study of chemistry, and of course, his collection. The world, though, has changed in many ways since Smith first started collecting books and manuscripts. Even Smith himself eventually came to recognize that most modern chemists were not interested in historical chemistry. Thus, where once a collection such as Smith's would rightly find its home among practitioners of chemistry, such collections are now of greater interest to scholars of the history of science and other fields in the humanities than to modern chemists, for whom material more than a year or two old can be considered out-of-date. In following this trend, the transfer of the Smith Collection from the Chemistry Department to the University Library can be seen as mirroring the move of the historical sciences to the humanities, a move marked by new and different functions for these materials. Today scientists in most disciplines look to the future, and not to the past, for their inspiration. However, the Smith Collection holds a multitude of riches for those who still seek their inspiration from the past.

Robert Hare's eudiometer. Smith Collection.