Notes from the Oesper Collections

Thomas Duché Mitchell

1791-1865

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Well into the third decade of the 19th century most, but by no means all, of the teaching of chemistry within the universities and colleges of Europe, Great Britain, and the United States was connected in some fashion with the teaching of medicine. This close connection of the two disciplines dates back to the beginning of the 17th century and the establishment of the first chairs of chemistry within the medical schools of Europe. It was the direct result of the claims of the 16th-century Swiss-German iatrochemist, Paracelsus, and his followers that chemistry held the key to understanding the nature of disease, the workings of the human body, and the effective preparation of medicines (1).

Most academic chemists of this period were formally trained as medical doctors (or occasionally as apothecaries) and earned their keep by teaching service courses in introductory chemistry to large classes of medical students. Chemical research, if it was pursued at all, was an avocation rather than a vocation. Successors in the tradition were selected from among the medical students and their training was obtained as a by-product of their formal medical education, usually by acting as a lecture assistant (and occasionally as a research assistant) to the current professor of chemistry.

In the United States a rather unusual concentration of such physician-chemists had grown up around the Medical School of the University of Pennsylvania by the end of the 18th century, supplemented by chemically-inclined druggists and manufacturers of chemicals and apparatus. This community has been described in some detail in the writings of Edgar Fahs Smith and Wyndham Miles and includes such names as Benjamin Rush, James Woodhouse and Robert Hare (2).

In a similar fashion, the initial development of the chemical communities in the Western cities of Cincinnati, Louisville and Lexington in the early 19th century was also closely linked with the rise of local medical schools and the tradition of the physician-chemist. Indeed, many of the early professors of chemistry in the newly-founded Western medical schools had been trained in Philadelphia – a connection illustrated by the life and career of Thomas Duché Mitchell (figure 1), who was to author the first full-length textbook of chemistry to be written and published in Cincinnati (3).

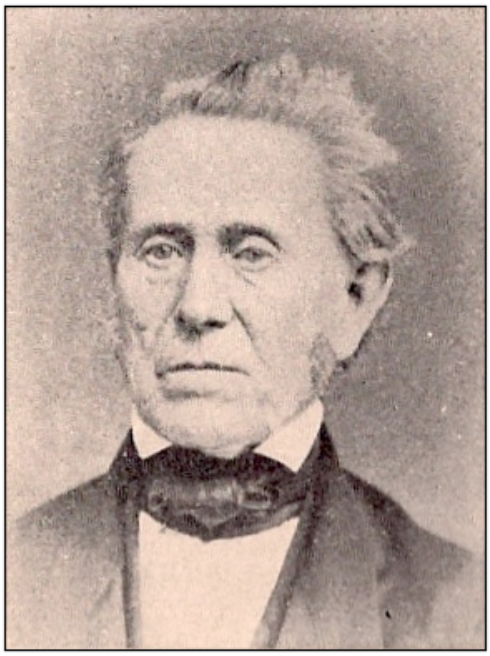


Figure 1. Thomas Duché Mitchell (1791-1865).

Education and Early Career

Mitchell was born in 1791 in Philadelphia, where his ancestors – who were of "proven respectability and morality," as one of his earlier biographers assures us – had lived for over four generations (4). He received his secondary English and classical education at Carson Academy and at the Friends' Academy, after which he spent a year in the drug store and chemical laboratory of Dr. Adam Seybert (1773-1825), a prominent member of the Philadelphia medical-chemical community, who specialized in the chemical analysis of minerals (5). This was followed by a four-year study of medicine under the preceptorship of Dr. Joseph Parrish (1779-1841), during which Mitchell also attended courses at the Medical School of the University of Pennsylvania. Graduating with an M.D. in 1812,

Mitchell was appointed Professor of Animal and Vegetable Physiology at St. John's Lutheran College in Philadelphia and, a year later (1813), as physician to the Philadelphia Lazaretto. In 1822 he began a medical practice in nearby Frankford (annexed to Philadelphia in 1854), where he remained until his move to Cincinnati nine years later.

Professorship at Cincinnati

The history of the early medical community in Cincinnati, and indeed in Ohio as a whole, is almost unparalleled for the Machiavellian nature of its internal politics. As one writer on the history of early American medicine summarized the situation (6):

Alongside the early medical history of Ohio, the stories of the preceding States seem like tales from a McGuffy reader. For sheer vituperation nothing could quite match Ohio medical broils. Not only did Ohio physicians enter the political arena with greater zeal than their counterparts elsewhere but, in addition, Ohio professional rivalries had a more personal, vindictive tone ... [Indeed] the frequency of public canings and fist fights within the "medical fraternity" leaves the historian with no problem in distinguishing professional alignments in Ohio.

It was into this maelstrom of intrigue and backbiting that Mitchell was to be innocently led in 1831, like a lamb to slaughter, by no less a luminary than Daniel Drake (figure 2), the man who formed the vortex about which most of the controversy in the Cincinnati medical community seemed to swirl (7).

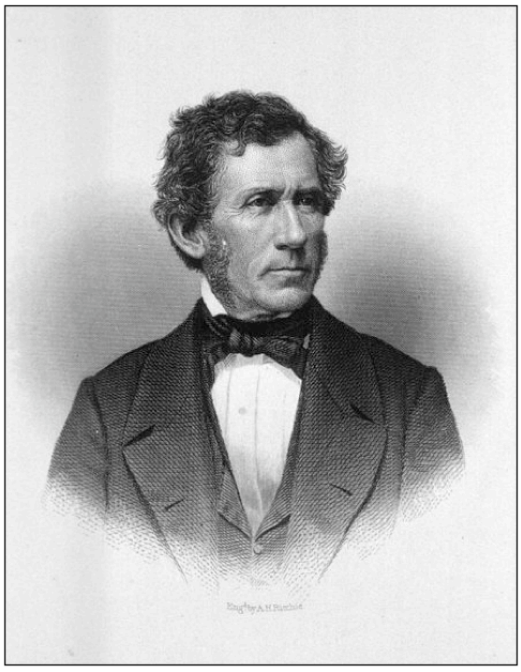


Figure 2. Daniel Drake (1785-1852).

Drake had organized the Medical College of Ohio – the first medical school in Cincinnati – in 1818 (officially chartered in 1819) but had been expelled by his own faculty four years later. He then accepted a chair with the Medical School of Transylvania University in Lexington, where he remained until 1827, when the school was disrupted by religious problems. Returning to Cincinnati, Drake bided his time until 1830, when he conceived the idea of founding a rival of his old medical school under the guise of a medical department associated with Miami University at Oxford, Ohio. Leaving his brother to work out the details with the University Trustees, Drake left for Philadelphia to teach for a term at Jefferson Medical College and to recruit a faculty for his projected school.

Among the staff collected by Drake during his stay in Philadelphia was Mitchell, who was offered the Professorship of Chemistry at a guaranteed annual salary of $2,000. This wage, coupled with Drake's personal magnetism, must have been compelling as Mitchell accepted, though he had declined an earlier opportunity to move West when he had been offered the Chair in Chemistry at Ohio University in Athens in 1820.

Plans for the new medical school were not finalized when Mitchell arrived in Cincinnati in the summer of 1831, so he temporarily accepted the Chair in Chemistry at Miami University. However, by the end of the year it was apparent that Drake's new school was not to be, so Mitchell resigned the chair at Miami and proceeded, perhaps for no other reason than he felt himself stranded in Cincinnati without his promised job, to accept the Chair in Chemistry and Pharmacy at Drake's old school – the Medical College of Ohio – the very organization which his arrival had been intended to undermine. In so doing, he firmly placed himself in the ranks of Drake's all too numerous enemies and immersed himself in the "endless wrangles and quarrels" of the Western medical community, from which he would not escape for the next 18 years.

Later Career

Mitchell remained as Professor of Chemistry and Pharmacy at the Medical College of Ohio until 1837, when he became Professor of Chemistry at the Medical Institute of Louisville. However, in a move reminiscent of the earlier situation in Cincinnati, he left within a month to accept a similar position at the Medical School of Transylvania University in Lexington. In 1839 he exchanged his chair in chemistry at Transyl-

vania for one in materia medica and therapeutics, (figure 3) which he held until 1849, when, in the words of Jeuttner, "thoroughly disgusted with the ways of western colleges," he returned to Philadelphia to lecture on the theory and practice of medicine, obstetrics, and medical jurisprudence at the Philadelphia College of Medicine (8). However, in 1852 he again returned to Kentucky to accept a chair at the Kentucky School of Medicine in Louisville, where he remained until 1857, when he became Professor of Materia Medica and General Therapeutics at Jefferson Medical College in Philadelphia. This proved to be the final move and Mitchell remained at Jefferson Medical College until his death on 13 May 1865 at the age of 74 (9).

The Columbian Chemical Society

Mitchell's interest in chemistry was doubtlessly stimulated not only by his experience with Seybert but by his preceptor, Parrish, who had given lectures on chemistry in Philadelphia between 1807 and 1810. Indeed, Mitchell began publishing articles on chemistry and medicine while still a student, his first known chemical piece on "Nitric and Nitrous Acids" appearing in *The Medical Museum* in 1809. Two years later, he and fellow student, George F. Lehman, organized the Columbian Chemical Society (10). This was the third such chemical society organized in Philadelphia (and indeed in the United States) and, like its two predecessors, it drew heavily on the local medical-chemical community for its membership. The first society had been organized in 1789 by John Penington and had lasted for only a year. The second attempt – The Chemical Society of Philadelphia – had been organized in 1792 by John Redman Coxe (1773-1864) and had lasted for about 15 years (11).

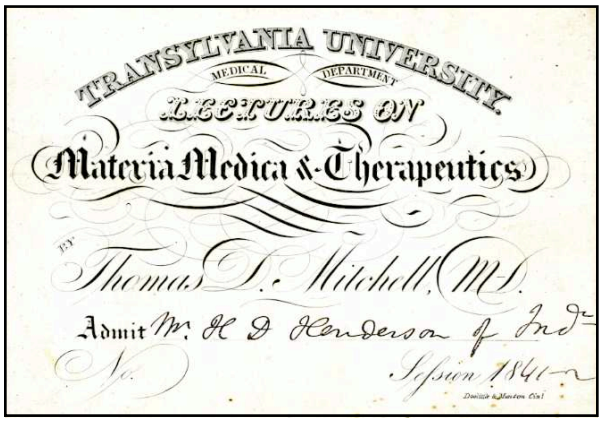

TRANSYLVANIA UNIVERSITY.
MEDICAL DEPARTMENT
LECTURES ON
Materia Medica & Therapeutics
BY
Thomas T. Mitchell, M.D.
Admit Mr. H. D. Henderson of Ind.
No. Session 1841-2

Figure 7. A lecture ticket admitting the holder to Mitchell's lectures on materia medica and therapeutics at Transylvania University.

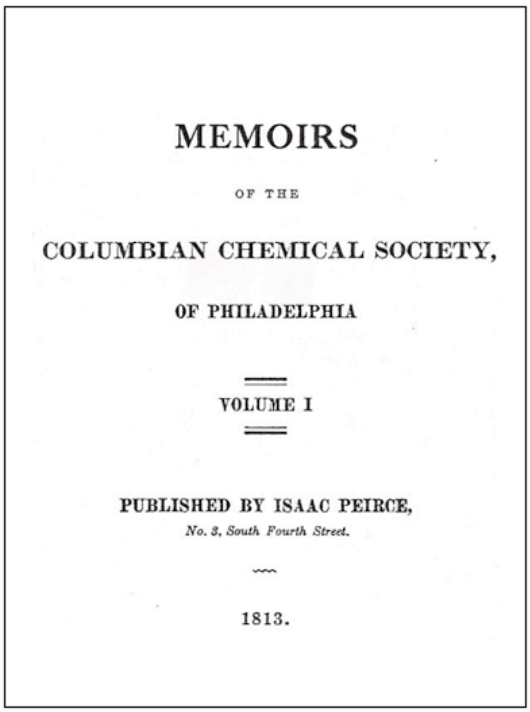

MEMOIRS
OF THE
COLUMBIAN CHEMICAL SOCIETY,
OF PHILADELPHIA
VOLUME I
PUBLISHED BY ISAAC PEIRCE,
No. 3, South Fourth Street.
1813.

Figure 4. Title page of the first and only volume of *The Memoirs of the Columbian Chemical Society.*

Though the Columbian Chemical Society would last for only three years (1811-1814), it was unique in that, unlike its predecessors, it actually succeeded in publishing a volume of memoirs in 1813 (figure 4). This was 221 pages in length and contained 26 papers by members of the society, nine of which were written by Mitchell, who, incidentally, had also served as the society's first president in 1811 and as a member of its corresponding committee the next year (12).

Except for a paper on an "Analysis of a Mineral Spring ..." (in conjunction with John Manners) and a short piece on an "Analysis of Malachite," all of Mitchell's contributions were nonexperimental essays. These included his doctoral thesis on "Acidification and Combustion" and several essays defending various aspects of Lavoisier's original system against the revisions suggested by Humphry Davy's work on chlorine and the more controversial use of Davy's apparent discovery of hydrogen in sulfur and phosphorus by John Redman Coxe, now Professor of Chemistry at the Medical School, to support a revised version of the phlogiston theory.

Coxe, whose theory closely resembled an earlier proposal of the American physician-chemist Samuel L. Mitchell (1764-1831), suggested that combustion involved not only the combination of the inflammable substance with oxygen but the simultaneous release of

phlogiston (now identified as hydrogen) from the inflammable, this latter ingredient having imparted the property of combustibility to the inflammable in the first place (13). This idea that common class properties, such as inflammability, metallic character, or acidity, were due to the existence of a common property-bearing component was a characteristic not only of the phlogiston theory, but of virtually all chemical thought back to Aristotle and had even carried over into Lavoisier's newer system via his concept of oxygen as the common principle of acidity.

In striking contrast to most of his fellow chemists, who continued to uncritically accept this mode of explanation, Mitchell appears to have adopted an approach based on the distinction between primary and secondary qualities made by the 17th-century English philosopher John Locke. Physical and chemical properties were not the inherent qualities of isolated substances, but rather the relative, system-dependent result of the interactions of several substances – one of which could correspond to the organs of sensation in the human being. Thus, Mitchell wrote (14):

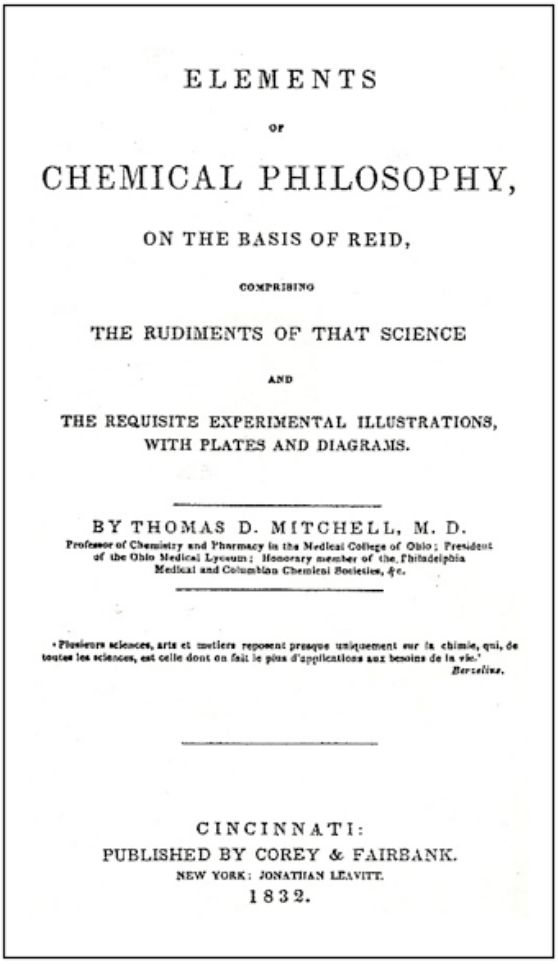
When we speak of the properties of bodies, as taste, smell, etc., we do not mean that any of them possess a positive quality. They are merely sensations or effects resulting from the action of these bodies on our organs of taste, smell, etc. Inflammation, like odors, is the result of relative circumstances and not the product of a single agent.

This meant that it was senseless to try to identify the properties of a mutual interaction as being due to a component that was preexistent within one of the two interacting substances. As Mitchell expressed it (14):

Matter, we know, has a capacity to be acted upon, but [is] not a principle of action. An alkali has the capacity of being converted into a neutral salt, by union with an acid, but it contains no principle of a neutral salt; and with as much logic may it be said, that a combustible contains no principle of combustion, or inflammability in itself. What is a neutral salt, but the result of the mutual action of an acid and an alkali, and what is combustion, but the effect of the mutual operation of oxygen gas, in some shape or other, and a combustible?

Mitchell, in his critical enthusiasm, also proceeded to question Davy's evidence regarding the elemental nature of chlorine and somewhat unfairly attacked the famous British chemist as "... the champion of the Phlogiston System ... [who] ... has endeavored to discover hydrogen in almost everything" (15). Nevertheless, his criticisms are well taken and have led a modern historian of chemistry to remark that they are both "very modern sounding" and "refreshingly clear amidst the fog of principles and essences which enveloped the phlogiston controversy" (13).

Mitchell appears to have retained his interest in chemistry after the collapse of the Columbian Chemical Society in 1814, since he is known to have published a small textbook of chemistry for medical students in 1819 entitled *Medical Chemistry or a Compendious View of the Various Substances Employed in the Practice of Medicine, that depend on Chemical Principles for their Formation* (16). However, after taking up his practice in Frankford, his chemical activities, at least as far as active publication is concerned, appear to have become dormant until he became Professor of Chemistry and Pharmacy at the Medical College of Ohio in 1831 (though, as will be seen, there is indirect evidence that he continued to give private lectures in chemistry in Philadelphia). Here he would produce his *Elements of Chemical Philosophy* (figure 5), a 553-page textbook based on his lectures at the


ELEMENTS

OF

CHEMICAL PHILOSOPHY,

ON THE BASIS OF REID,

COMPRISING

THE RUDIMENTS OF THAT SCIENCE

AND

THE REQUISITE EXPERIMENTAL ILLUSTRATIONS, WITH PLATES AND DIAGRAMS.

BY THOMAS D. MITCHELL, M. D.

Professor of Chemistry and Pharmacy in the Medical College of Ohio; President of the Ohio Medical Lyceum; Honorary member of the Philadelphia Medical and Columbian Chemical Societies, &c.

"Plusieurs sciences, arts et metiers reposent presque uniquement sur la chimie, qui, de toutes les sciences, est celle dont on fait le plus d'applications aux besoins de la vie."

Berzelius.

CINCINNATI:

PUBLISHED BY COREY & FAIRBANK.

NEW YORK: JONATHAN LEAVITT.

1832.

Figure 5. The title page of Mitchell's textbook.

medical college and published by the Cincinnati firm of Corey and Fairbank in 1832 (17).

Elements of Chemical Philosophy

Dedicated to "Students of Medicine and Lovers of Chemical Science in the Valley of the Mississippi," Mitchell's textbook is supposedly based on the book *Elements of Chemistry: Theoretical and Practical* by the Scottish chemist, David Boswell Reid (18), though a comparison of the two volumes shows that Mitchell's work, unlike many other American texts of the period (19), was entirely original, he having only adopted Reid's order of presentation for the descriptive sections. These begin, after four introductory chapters dealing with theory and nomenclature, with "simple substances - not metallic" (O, H, N, S, Se, P, C, B, Cl, I, Br, F), followed by "alkalifiable metals" (K, Na, NH_4, Li), "alkaline geofiable metals" (Ca, Ba, Mg), "geofiable metals" (Al, Si, Be, Y, Zr, Th), "metals whose oxydes cannot be reduced by heat alone" (Fe, Pb, Cu, Zn, Sb, As, Sn, Bi, Mn, Cr, Co, W, Mo, U, Nb, Ta, Ti, Ce, Cd, Te, V and "pluranium") and, lastly, "metals whose oxydes can be reduced by exposure to heat without the aid of inflammable matter" (Hg, Ag, Au, Pt, Ni, Pd, Rh, Os, Ir). The book is completed by two rather miscellaneous sections dealing with such assorted topics as animal substances, mineral water analysis, lutes and cements, acidimetry and alkalimetry, etc.

Other deviations from Reid's approach include the grouping of most organic compounds under the subject of carbon rather than in separate chapters on animal and plant chemistry, as was the common practice during this period, and a rendering of Reid's original terminology of kalegenous, terrigenous and calcigenous metals as the above mentioned alkalifiable, alkaline geofiable and geofiable categories. As for the supposed element "pluranium," Mitchell regrettably provides no details, simply dismissing it, along with Ce, Cd, and Te, with the statement (p. 467) that "our limits do not allow of the introduction of articles that have so little importance attached to them."

The size of the textbook, as well as various statements in the preface and in the text itself (p. 453), all suggest that the book was not the *de novo* product of Mitchell's first year of lectures at the Medical College, but rather the final result of a set of public lectures that had been evolving since Mitchell's involvement with the Columbian Chemical Society two decades earlier. Indeed, all of the themes underlying Mitchell's chemical activities in the period 1809-1813 reappear in the book, including his relativist stands on the nature of inflammability (p. 274) and acidity (p. 44), his defense of Lavoisier's original system (pp. 60, 272-3, 284), his now-retracted, but still jaundiced view of Davy's work on chlorine (pp. 235-274), and assorted references to various papers published in the *Memoirs of the Columbian Chemical Society*, including most of his own (pp. 44, 56, 145, 274, 403). Many other references to the activities of the Philadelphia chemical-medical community are also included, the most notable being a claim for the independent isolation of potassium by James Woodhouse (pp. 286, 290) and a defense of Robert Hare's priority in the discovery of the oxy-hydrogen blowpipe (p. 69).

These preoccupations, coupled with Mitchell's use of the first-person tense, the free and rather forceful expression of his opinions on the relative merits of various theories, and his extensive use of original first-hand anecdotes and examples, all combine to give the reader a sense of actually being present in Mitchell's lectures and result in a delightfully readable book. Typical specimens include his comments at the end of his discussion of Davy's work on chlorine (p. 236):

I have always objected to the appellation chlorine, even admitting the simple character of the substance to be forever settled. I do not know, that a gas may ever be discovered which shall have precisely the same shade of green, and in the event of such a discovery, there would necessarily be some little confusion.

or his elegant and rather forceful restatement of his relativist stand on the nature of acidity and the concept of emergent properties (p. 44):

On the subject of an acidifying principle, I have given my views at length, some years ago. It may not be amiss, however, to state in this place, that the advances which chemical science is constantly making, have confirmed my earlier opinions on this point. I repeat, that the term acidifying principle is unphilosophical, not only as applied to oxygen, but to hydrogen, and to every agent which may be supposed to exert an influence in developing acid properties. Every result in nature or produced by art, is a relative effect, and every item concerned, remotely or directly, in the accomplishment of the end, is essential to that end. Hence, I insist, that if an acid be discovered which shall contain fifty component parts, all of which are requisite to the formation of the compound, the only characteristic of which is acidity, I may affirm with equal propriety of any one, as of the other, of its constituents, that this or that is the acidifying principle. Abstract from the compound either of its parts, and you destroy the peculiar, distinctive character of the acid.

A negative aspect of these earlier preoccupations, however, was Mitchell's refusal (preface) to include a discussion of the electrochemical theories of chemical affinity developed by the Swedish chemist, Jöns Jakob Berzelius, and by Humphry Davy, possibly because of a reluctance to trust the work of the famous British chemist stemming from Davy's earlier involvement in the phlogiston revival (20). In any case, the result is that Mitchell's theoretical framework is more characteristic of the situation prevailing during his student years than of the "recent chemical advances" mentioned in his relativist position on acidity, though his stand on the latter topic was still well in advance of the views of most of his contemporaries.

Laboratory Facilities

The immediate sense, conveyed by the textbook, of being present in Mitchell's lectures is further reinforced by the marginal notes indicating at which points Mitchell performed demonstrations to illustrate the lectures, as well as by his first-person description of the results. With respect to these demonstrations, Mitchell was lucky in having inherited relatively new laboratory-lecture facilities, as the Ohio Medical College had built a new building in 1826 (figure 6). Mitchell described these accommodations in an article published in the April 1832 issue of *The Western Medical Gazette* (21):

The ground floor [of the College] contains a capacious lecture hall for the chemical department, to which is attached a laboratory building and private room, with smaller apartments for storing various articles that are required by the professor of chemistry. The lecture hall will accommodate three hundred students. Between it and the laboratory, is a partition of folding shutters, which can be opened or closed at pleasure. The shutters are thrown open for the hours of lecture and closed when the hall only is wanted, as for the meetings of the Ohio Medical Lyceum.

This interconnection of the laboratory with the front of the lecture hall was a common feature of laboratory design during this period and can also be seen in the description of Robert Hare's laboratory at the University of Pennsylvania (23) and in the more famous laboratory of the Royal Institution in London used by Davy and Faraday (23).

Though Mitchell inherited laboratory and lecture space, he apparently did not inherit much equipment, as earlier descriptions of his predecessor, Elijah Slack, frequently refer to Slack's use of his own "personal" collection of apparatus (24) and Mitchell himself mentions (p. 453) equipment he had brought with him from Philadelphia. Like Slack before him, Mitchell apparently took most of his personal equipment with him when he left for Louisville and Lexington, as his successor, John Locke, found the laboratory so "wanting in the necessary means of illustration," that he immediately departed for Europe in order to purchase "many thousands of dollars worth of equipment" (25).

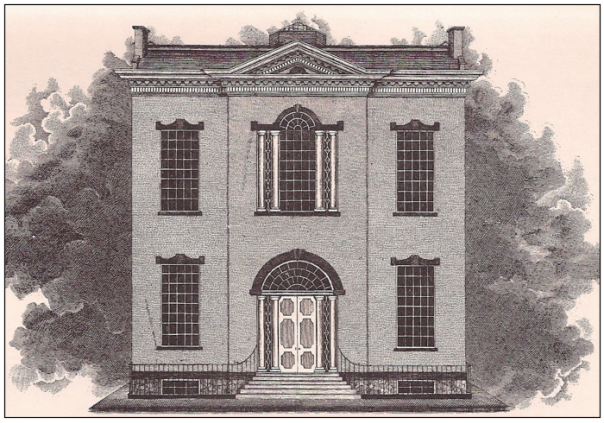


Figure 6. The Medical College of Ohio as it appeared in 1826. Located on 6th Street between Race and Vine, its chemical lecture hall was located on the ground floor to the right of the entrance. Mitchell taught chemistry in this building from 1831-1837.

We also know, from comments in the textbook, that Mitchell worked in the laboratory on a regular basis, as he occasionally mentions original observations, such as the following (p. 452) concerning the accidental production of K_2MnO_4 via the reaction:

$$2KNO_3 + MnO_2 \rightarrow K_2MnO_4 + 2NO_2 \qquad [1]$$

and published others in *The Western Medical Gazette* (26):

During the winter of 1831-32, I made a large quantity of this substance [K_2MnO_4], without intending or expecting to do so; and as the same contingencies may fall to the lot of others, the incident is worth relating. I happened to be in the act of preparing oxygen gas from nitre [KNO_3], for my lectures on that subject, and was greatly surprised to find that the gas ceased to come over much earlier than on former occasions. I was using the ordinary iron bottle and a bent gun-barrel, to which a leaden tube, twenty feet long, was attached. About a pound and a half of powdered nitre had been placed in the bottle (capable of holding a half gallon by measure) and I had not collected one hundred cubic inches of gas. I directed my assistant to remove the luting and detach the pipe from the gun barrel, in order

to ascertain, if possible, the source of disappointment. He informed me, at once, that the barrel and pipe were quite choked, with something like verdigris, and at first sight his impression seemed correct. The passage was almost entirely obstructed, and it was really wonderful, that an explosion had not taken place, for the bottle had been, for more than a half hour, at full red heat. All at once, however, it occurred, that I had attempted to make oxygen gas in the previous winter in the same bottle, and that I had then used black oxyde of manganese [MnO_2], but had not taken the trouble to clean it out after the observation was over. Of course, the bottle, when placed on the furnace in the expectation of getting pure gas from nitre, and in large quantities, contained, not simply the nitrate of potash, but the black oxyde of manganese, also. Here were the very articles requisite to the formation of the chameleon mineral [K_2MnO_4] and my furnace was precisely the place for effecting the requisite combination.

Further information on the laboratory can be gleaned from Mitchell's description of its pneumatic trough for the collection and study of gases, which was made of polished sand stone and could hold 150 pounds of mercury (p. 106).

Personality and Lecture Style

Mitchell's rather assertive approach to his lectures, as well as his obvious pride in his own contributions to what he considered to be some of the key chemical issues of the day, apparently did not set well with some of his colleagues at the Medical College, as they seem to have interpreted these tendencies as a form of Eastern snobbishness. Thus Juettner described Mitchell as "scholarly but tiresome" and as "full of his own importance – a typical pedant with a monotonous nasal voice and without any animation at any time" (4). Interestingly, he further claimed that "as a lecturer and teacher, Mitchell was not much of a success. He followed an alphabetical arrangement of subjects and, in his presentation and delivery, was dry to the verge of utter barrenness" (4).

As noted above, this is in direct contradiction to the evidence of Mitchell's textbook, as well as to Mitchell's own statement in the preface regarding "the deep interest manifested by a large proportion of the class in the Medical College" which was both "gratifying to the lecturer" and "demonstrative of a happy advance in taste and good sense." Added to this are the testimony of one of Mitchell's later colleagues in Philadelphia that Mitchell's "method of lecturing [was] ready, fluent, extemporaneous, and clear" and that there was "not a better teacher of his branch in our city – perhaps not in the United States" (27), and Edgar Fahs Smith's characterization of Mitchell's earlier textbook of *Medical Chemistry* as "most refreshing" and as "splendidly written" (28). Finally, Peter, who was a colleague of Mitchell at Transylvania, reported, long after Mitchell's death, that he "was a clear and impressive lecturer, a most industrious student even in his latter days, a learned, classical, and scientific scholar and a most rigidly upright and conscientious gentleman," though he also noted that (4):

Mitchell was an exceedingly rapid speaker. With difficulty could those unused to this peculiarity follow his swift flow of language and ideas. But once accustomed, his pupils liked this better than the more deliberate speech of other professors.

Thus, on the whole, one must take Jeuttner's evaluation with a grain of salt, as it undoubtedly reflects the bitterness of the interpersonal rivalries that plagued the Cincinnati medical community, as well as Jeuttner's own hero-worship of Drake and his tendency to vilify those who either opposed Drake or, at worst, failed to actively support him.

Questions of his teaching abilities aside, there is one negative quirk of Mitchell's "most rigidly upright" personality of which we are more certain – namely, his almost fanatical opposition to the use of alcohol. This led to his founding of a "Total Abstinence Society" (1826) while he was practicing medicine in Frankford and to some rather severe written appraisals of his fellow physicians – both dead and alive – who did not share his views. Consequently, one can sympathize somewhat with the claims of one of Mitchell's colleagues at Transylvania, who was a living recipient of one of these appraisals, that Mitchell was "a narrow-minded, bigoted, presumptuous puritanical Presbyterian" (29). Mitchell even went so far as to advocate the removal of alcohol from medicine and projected, but never completed, "a Treatise on Pharmacy, in which the nature, compounds, and uses of medicinal substances will be examined without the pernicious influence of alcohol" (30). His textbook of chemistry naturally included comments on the same subject (pp. 167, 212) and also contained a severe condemnation (p. 83) of the use of nitrous oxide or laughing gas demonstrations by the popular lecturers of the day (figure 7):

In some persons it [N_2O] excites wrathful feelings, in others the most pleasurable sensations, while in not a few, the effects are wholly deceptive. Of this, I have been assured by some who have inhaled it, and who played the fool with tolerable success, but who have since declared, that they were simulating, all the while.

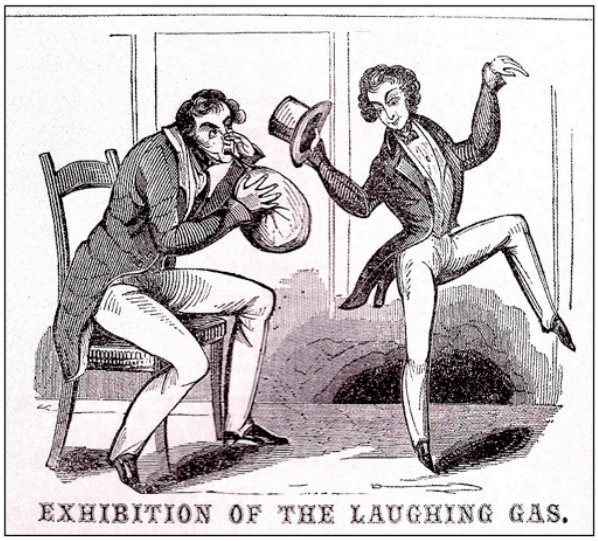


Figure 7. The kind of chemical buffoonery to which Mitchell objected in his textbook.

Occasionally, it has done serious mischief – I regard its administration to a class as the very buffoonery of science, and think it should be made an indictable offense.

When Mrs. Trollope complained in her famous book of travels that the people of Cincinnati had no sense of fun, she knew whereof she spoke.

Medical Activities

We have naturally emphasized the chemical aspects of Mitchell's career, though these form only a fraction of his activities. Thus, in addition to his two textbooks of chemistry and a projected, but never published, *Western School Book of Chemistry* (31), he also published a study guide for students at the Ohio Medical College (32); an influential textbook of materia medica and therapeutics (33); a biography of his fellow physician, John Eberle (34); and more than 96 articles and notes, of which about 20 deal with chemistry (4, 35). Mitchell also received an honorary MA from Princeton University (1826), served as co-editor of *The Western Medical Gazette* (1832-1835), as editor of *The Transylvania Journal of Medicine and the Associated Sciences*, as President of the Ohio Medical Lyceum, and as Dean of the Transylvania Medical School (1839-1846).

In his evaluation of Mitchell's overall career, Jeuttner was characteristically harsh, dismissing him as a "well meaning, but extremely weak character ... [whose] ... influence in the various medical schools with which he was connected was practically nil" (4).

A much more suggestive evaluation was provided by Miles (4):

Mitchell's career is reminiscent of that of a number of other chemists of his time. In his youth, he demonstrated enthusiasm and competence in chemistry and presumably could have developed into an influential member of the profession, but his chemical growth was stunted by lack of opportunity. There were no academic, industrial, or government positions for him to occupy, and for 20 years he had to support himself by medicine. He was 40 years old before he became a professor of chemistry, and then the institution with which he was connected had little to offer him in the way of research facilities or advancement. We can only speculate what his career might have been had he been able to specialize in chemistry all of his life.

Whichever of these evaluations is accepted, there is little doubt that, in the form of his textbook, Mitchell left the Cincinnati chemical community with one of its most valuable legacies (36).

References and Notes

1. A. G. Debus, "Chemistry and the Universities in the Seventeenth Century," *Med. Kon. Acad. Weten. Lett. Schone Kunst. België*, **1986**, *48*, 15-33.

2. E. F. Smith, *Chemistry in America*, Appleton: New York, NY, 1914; *Chemistry in Old Philadelphia*, Lippincott: Philadelphia, PA, 1919; *James Woodhouse, A Pioneer in Chemistry*, Winston: Philadelphia, PA, 1918; *Life of Robert Hare, An American Chemist (1781-1858)*, Lippincott: Philadelphia, PA, 1917.

3. For a more general overview of the Philadelphia scientific community and its relation to the early 19th-century communities in Cincinnati and Lexington, see J. C. Greene, *American Science in the Age of Jefferson*, Iowa State: Ames, IO, 1984, Chapters 2 and 5.

4. The following (especially Payne) have proven useful in establishing the outlines of Mitchell's career:

a) V. F. Payne, "Thomas Duche Mitchell," *Filson Club Hist. Quart.*, **1957**, *31*, 349.

b) O. Juettner, *Daniel Drake and His Followers*, Harvey: Cincinnati, OH, 1909, pp 140-141.

c) A. Schachner, "Thomas Duche Mitchell," in H. A. Kelly, W. L. Burrage, Eds., *Dictionary of American Medical Biography*, Miford House: Boston, MA, 1971, p. 857.

d) P. M. Ashburn, "Thomas Duché Mitchell," in D. Malone, Ed., *Dictionary of American Biography*, Vol. 13, Scribners: New York, NY, 1934, p. 66.

e) W. D. Miles, Ed., "Thomas Duché Mitchell," in W. D. Miles, Ed., *American Chemists and Chemical Engineers*, ACS: Washington DC, 1976, pp. 341-342.

f) R. Peter, *The History of the Medical Department of Transylvania University*, Morton: Louisville, KY, 1905, pp. 109-114.

g) W. W. Jennings, *Transylvania, Pioneer University of the West,* Pageant Press: New York, NY, 1955.

5. C. R. Hall, "Adam Seybert," in D. Malone, Ed., *Dictionary of American Biography*, Vol. 17, Scribners: New York, N.Y., 1935, pp. 2-3; and E. F. Smith, *Chemistry in Old Philadelphia* (2), pp. 24-43.

6. J. F. Kett, *The Formation of the American Medical Profession: The Role of Institutions 1780-1860*, Yale: New Haven, CT, 1968, pp. 79-80.

7. E. F. Horine, *Daniel Drake (1785-1852), Pioneer Physician of the Midwest*, University of Pennsylvania: Philadelphia, PA, 1961, also Jeuttner (4).

8. Actually Mitchell's movements are even more complex. Entries in the Cincinnati City Directory for 1836-1837 suggest that although he remained in Cincinnati until 1837, when he went to the newly organized Medical Institute of Louisville, he actually ceased acting as Professor of Chemistry and Pharmacy at the Medical College of Ohio in 1835, as the directory lists John Locke as the professor for 1836-1837, though it still gives a street address for Mitchell. This agrees with the termination date given by Jeutner (4) and indications that the dissatisfied Trustees began a reorganization of the College about this time. Also, between 1847 and 1849, Mitchell apparently tried to hold simultaneous positions at Transylvania and the Philadelphia College of Medicine.

10. W. D. Miles, "The Columbian Chemical Society," *Chymia*, **1959**, *5*, 145.

11. W. D. Miles, "Early American Chemical Societies," *Chymia,* **1950**, *3*, 95. Also, W. D. Miles, "John Redman Coxe and the Founding of the Chemical Society of Philadelphia in 1792," *Bull. Hist. Medicine*, **1956**, *30*, 469; and H. C. Bolton, "Early American Chemical Societies," *Pop. Sci. Monthly,* **1897**, *51*, 819.

12. A complete listing of the contents of the memoirs can be found in E. F. Smith, *Chemistry in America* (2), pp. 213-214. According to Miles and Peter (4), the articles by Mitchell on acidification and combustion were based on his medical thesis at the University of Pennsylvania.

13. R. Siegfried, "An Attempt in the United States to Resolve the Differences between the Oxygen and Phlogiston Theories," *1sis*, **1955,** *46*, 327.

14. T. D. Mitchell, "An Analysis of Professor Coxe's Essay on Combustion and Acidification," *Mem. Columbian Chem. Soc.*, **1813**, *1*, 179.

15. T. D. Mitchell, "On Muriatic and Oxy-muriatic Acids, Combustion, etc.," *Mem. Columbian Chem. Soc.*, **1813**, *1*, 103. See also, T. D. Mitchell, "Critical Remarks on the Bakerian Lecture of 1809," *Medical Repository*, **1812**, *15*, 287.

16. T. D. Mitchell, *Medical Chemistry, or a Compendious View of the Various Substances Employed in the Practice of Medicine, That Depend on Chemical Principles for Their Formation*, Pennsylvania, PA, 1819.

17. T. D. Mitchell, *Elements of Chemical Philosophy*, Corey and Fairbank: Cincinnati, OH, 1832.

18. D. B. Reid, *Elements of Chemistry: Theoretical and Practical*, 3rd ed., MacLochlan Steward & Co: Edinburgh, 1839. Mitchell obviously used an earlier edition but the preface indicates no major revisions, so this edition was used in making comparisons.

19. For a typical example see J. W. Webster, *A Manual of Chemistry*, Richardson and Lord: Boston, MA, 1826. This was literally an abridged reprint of Brande's *Manual of Chemistry* with selections from the textbooks of Davy, Henry and others pasted in. Webster considered himself to be a compiler rather than an author.

20. Other examples of Mitchell's preoccupation with Davy can be seen in his comments on Woodhouse's isolation of potassium (p. 286) and in the extended review he gave of Paris' *Life of Davy* in *The Western Medical Gazette*, **1832**, *1*, 55, 87, 107, 124, 138.

21. T. D. Mitchell, "The Medical College Edifice," *The Western Medical Gazette*, **1832**, *1*, 113.

22. E. F. Smith, *Life of Robert Hare* (2).

23. D. Chilton, N. G. Coley, "The Laboratories of the Royal Institution in the 19th Century," *Ambix*, **1980**, *27*, 173.

24. *Liberty Hall*, **1819** (*April 27*), p 1, c 6; p 3, c 1.

25. A. G. Drury, "John Locke," in H. A. Kelly, W. L. Burrage, Eds., *Dictionary of American Medical Biography*, Miford House: Boston, MA, 1971, p. 751.

26. T. D. Mitchell, "Preparation of Carbonic Oxyde Gas," *The Western Medical Gazette*, **1832**, *1*, 35; "Reinvention of Hare's Compound Blowpipe," *Ibid*., **1834**, *1*, 293; "Brief Hints on the Chemical Nomenclature of Berzelius," *Ibid*., 294; "The Combustion of Arsenic in Chlorine Gas and the Extemporaneous Formation of Iodine," *Ibid*., 296; "The Electrochemical Method of Detecting Metallic Poisons," *Ibid*., 298; "Iodine and Its Compounds," *Ibid*., 361; "Carbonic Oxide," *Ibid*., **1835**, *2*, 333; "Remarks on Certain Chemical Explanations given by Dr. Yandell," *Ibid*., 565.

27. Cato, "Sketches of Living Physicians. No. 22. Thomas D. Mitchell," *The Boston Medical and Surgical Journal*, **1851**, *45(Dec. 10)*, 390. Quoted in Payne (4).

28. E. F. Smith, *Chemistry in Old Philadelphia*, p. 101 (2).

29. Quoted in Payne (4).

30. Quote from the textbook, p 167. See also the comments in *The Western Medical Gazette* quoted by Payne (4).

31. Mentioned in Payne (4).

32. T. D. Mitchell, *Hints on the Connection of Labour with Study*, Corey and Fairbank: Cincinnati, OH, 1832.

33. T. D. Mitchell, *Materia Medica and Therapeutics*, Lippincott, Grambo & Co: Philadelphia, PA, 1850.

34. T. D. Mitchell, "John Eberle," in S. D. Gross, Ed., *Lives of Eminent American Physicians and Surgeons of the*

Nineteenth Century, Lindsay & Blakeston: Philadelphia, PA, 1861.

35. A further list of pamphlets by Mitchell can be found in the *Index-Catalogue of the Library of the Surgeon-General's Office, United States Army (Authors and Subjects)*, Vol. 9, Washington: DC, 1888, p. 348.

36. I think Miles is wrong in some ways. Mitchell was offered, but refused, two professorships of chemistry (Athens and Miami) in order to remain affiliated with medical schools and while at Transylvania voluntarily exchanged his professorship in chemistry for a higher status chair in materia medica and therapeutics.

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