

**RESEARCH PUBLICATIONS OF THE
UNIVERSITY OF MINNESOTA; CURRENT
PROBLEMS NUMBER 13; A HISTORY
OF THE TEACHING OF CHEMISTRY IN THE
SECONDARY SCHOOLS OF THE UNITED
STATES, PREVIOUS TO 1850**

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SAMUEL RALPH POWERS

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A HISTORY OF THE TEACHING OF CHEMISTRY IN THE
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PREVIOUS TO 1850

BY

SAMUEL RALPH POWERS, M.A.



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PREFACE

No less authority than Foster Watson is sponsor for the statement that the history of the study of Latin is the history of secondary education well into the nineteenth century. We have long known in a general way, at least, the factors which delayed the introduction of the natural sciences, but we have been sadly lacking in information as to when and how the natural sciences began their invasion of the curriculum. Mr. Powers has made a valuable contribution not only to the history of the teaching of chemistry, but to the general history of education. He has presented in a clear and interesting manner the many factors which brought chemistry into the foreground of social and intellectual interests and finally secured for it a place in the schools. In addition to the valuable data which his painstaking efforts have brought together, he has made clear the sequence of forces which are universally at work in bringing about changes in school curricula,—namely, new social and industrial needs; quests for new knowledge to meet these needs; rise of a new science (in this case, chemistry); efforts to gain for the new science a place in the schools; establishment of a new study; subsequent formalism and devitalization; efforts to rehumanize or revitalize the now thoroughly established and thoroughly respectable study, by teaching it in close relation to such concrete problems as originally led to its introduction. From this summary statement it is evident that Mr. Powers' study, though treating only one school subject and that for a comparatively brief period, will provide students of the history of education and students of secondary education not only with an explanation of many conditions and factors in the present educational situation, but also with the basis of an illuminating chapter in educational and social philosophy.

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A HISTORY OF THE TEACHING OF CHEMISTRY IN THE SECONDARY SCHOOLS OF THE UNITED STATES PREVIOUS TO 1850

CHAPTER I THE BEGINNINGS OF CHEMISTRY IN THE UNITED STATES

The importance assigned to science subjects in the curricula of American secondary schools¹ prior to the middle of the nineteenth century has not been generally recognized. A writer on the history of education of no less prominence than Cubberley says of the American high-school curricula, "First to be introduced was history and English literature and then the modern languages. In the seventies and eighties came the sciences, first in book form and shortly afterwards as laboratory studies."² This same statement is made by Snedden in his article on "The Curriculum" (of the high school) in Monroe's *Principles of Secondary Education*.³ Such a statement, although carrying with it the support of two eminent educators, is evidently based on a very incomplete knowledge of the facts. Any statement which implies that the sciences were excluded from the curricula of the American secondary schools previous to the middle of the nineteenth century does not correspond with the actual situation. From the facts to be presented in subsequent paragraphs, it will be evident that during the first half of the nineteenth century instruction in elementary science was prominently before the minds of educators; that science had gained a definite place in many secondary schools; that institutions devoted to the training of teachers of science had been established; that the foundation for instruction in science which had been laid during this earlier

¹ E. P. Cubberley, *High Schools*, Monroe's *Cyclopedia of Education* 3:257h.

² Mr. Snedden omits quotation marks and any reference to Cubberley, but evidently he felt that he could rely upon the historical accuracy of Cubberley, as the quotation which constitutes an entire paragraph is verbatim. Paul Monroe, *Principles of Secondary Education* p. 215.

³ The term secondary school is used in this paper to include all schools offering instruction to pupils of adolescent age. See B. F. Pittenger. Uses of the Term "Secondary" in American Education, *School Review* 24:132.

period was a permanent one; and finally that the present courses in science in our high schools have been built upon these early foundations.

The problem of the present study is to discover when chemistry was first introduced into the secondary schools of the United States; to determine to what extent it became a general study of the secondary schools of the United States prior to 1850; and to discover the factors which have led to its wide introduction into the high schools of to-day. It is believed that the factors which contributed to the introduction and development of chemistry-teaching contributed to the introduction and development of the teaching of the other sciences also, and that they are in part typical of the factors which have led to the introduction of all other subjects which occupy a place in our high-school curriculum.

No complete record of the early history of American schools is available. Journals dealing primarily or incidentally with school matters were published early in the nineteenth century, and it is from such of these as are available that the material for this paper is largely taken. The (first) *American Journal of Education* edited by William Russell began publication in 1826. It was continued as *The American Annals of Education*, edited by W. C. Woodbridge, from 1831 to 1836. These journals are a most important source of information concerning education during the period of their existence. Bulletins and catalogs of courses of study issued by secondary schools, colleges, and universities serve as other important sources of information.^b

In attempting to establish the time when instruction in chemistry began, it would, of course, be futile to look to a period of time earlier than the science itself. The status of chemical science at the close of the eighteenth century shows that at this time it was too embryonic to have secured a place in any of the secondary schools then in existence. It may be well to note here a few of the more important facts which support this contention.

The eighteenth century witnessed the decline of alchemy and the birth of chemistry. The experimental researches of Black (1728-99), Cavendish (1731-1810), Priestley (1733-1804), and Lavoisier (1743-94) demonstrated to the world the possibilities

^b For complete list of material consulted see bibliography.

of chemical science. It is said that when, in 1755, Joseph Black graduated from the University of Edinburgh with the degree of M.D., "his thesis on *Magnesia Alba, Quicklime, and Other Alkaline Substances* contained the results of what is probably the first accurately quantitative examination of a chemical action which we possess."³ The classic researches of Cavendish, Priestley, and Lavoisier on water and the gases of the atmosphere are, indeed, the foundation upon which the modern science of chemistry is built. Notwithstanding the fact that the science of chemistry made considerable progress during the latter part of the eighteenth century, Ernst von Meyer, in his *History of Chemistry*, says that at the beginning of the nineteenth century

there were practically no laboratories for general instruction in chemistry. In lectures upon physics, mineralogy, and anatomy, chemistry was relegated to a very subordinate place. . . . It is true that there were chairs of chemistry in various universities and colleges,⁴ but the lectures on this subject were usually conjoined with those upon one of the subjects just named, in such a manner that chemistry was forced into the background.

In France, where toward the end of the eighteenth century it began to be perceived that instruction in natural science must be fostered by every means at command, a start was made before any other countries, in respect to the development of chemical study. Up till then apothecaries' shops were the only places where work in practical chemistry could be carried on, and there merely after certain prescriptions and not according to scientific methods.⁵

A statement made in 1790 by Joseph Priestley, the discoverer of oxygen, and a famous pioneer in chemical research, is indicative of the status of scientific subjects in England at this time. Priestley wrote, "I am very sorry to observe that natural science is very little, if at all, the subject of education in this country [England]."⁶

The status of chemical science in American universities at the opening of the nineteenth century is well expressed in an article in the *Medical Repository* for 1800, published at New York, under the caption *Liberal Decree of the Trustees of Columbia College with Respect to Chemistry*.

³ Pattison M. M. Muir, *Heroes of Science—Chemists* p. 3.

⁴ Ernst von Meyer, *History of Chemistry* (tr. by George McGowan) p. 642.

⁵ Priestley, *On Air* 1:xxix. Quoted by Florian Cajori, *History of Physics* p. 289.

⁶ The first professor of chemistry at Oxford (England) was appointed in 1683. The first professor of chemistry appointed at Cambridge (England) was officially appointed in 1702. Foster Watson, *The Beginnings of the Teaching of Modern Subjects in England* p. 232.

Notwithstanding it has been so long known that natural philosophy, or the science of experimental physics is divided into two great branches, the mechanical and the *chemical*, still the former which only treats of the more obvious and sensible properties of matter, has been taught in colleges and universities. The *latter* which is employed in ascertaining the laws which govern the composition and decomposition of material bodies, and scrutinizing more nearly the relations and affinities of their component atoms, has rarely or never entered the plan of what is termed a genteel or liberal education, but has been improperly considered as auxiliary to the medical profession.⁴ The trustees of Columbia College have wisely corrected this error by determining at one of their late meetings that the study of the *chemical branch of physics* should precede the conferring of the degree of Bachelor of Arts upon the students of that seminary; of course the youths educated will have the advantage of becoming acquainted not only with natural philosophy, as it is commonly termed but also with chemistry. This is an example highly worthy of the imitation of other places of instruction.⁵

It appears, however, that there was at least one college that had preceded Columbia⁶ in setting this example. John Maclean in his *History of the College of New Jersey* (Princeton) says that this institution made provision for academic instruction in chemistry as early as 1795, and makes the following claim for the priority of New Jersey College:

In the medical schools of Philadelphia, New York, and Cambridge in connection with the University of Pennsylvania and with Columbia and Harvard Colleges, there had been previously to Dr. Maclean's appointment as Professor at Princeton, lectures on Chemistry; but the above mentioned provision for the instruction of undergraduates in this branch of science was the first of the kind ever made in this country, unless possibly, Chemistry in connection with Natural Philosophy and as a branch of it may have been a subject of instruction at the college of William and Mary in Virginia, and the University of Pennsylvania at an earlier date.⁷

⁴ *Medical Repository* for 1800, published at New York by Drs. Mitchell and Miller p. 205. Quoted in John Maclean's *History of the College of New Jersey* pp. 10-11.

⁵ *History of the College of New Jersey* 2:8-9.

⁶ The theory of iatro-chemistry developed by Paracelsus (1493-1541) and his followers accounts for the fact that chemistry was taught in the medical schools long before its value as a subject for study in a liberal system of education was recognized.

⁷ Columbia had long been giving lectures in chemistry before the medical school. An account of the opening lecture before the medical school is well deserving of mention. "Dr. Smith, Professor of Chemistry gave an introductory lecture on that branch which for elegance and sublimity met with universal approbation." The lecture was given on the day following the opening of the medical school. Quoted from the *New York Mercury* of November 9, 1764, in *A History of Columbia University, 1754-1804* p. 301.