

A REVIEW OF A CENTURY OF CHEMICAL EDUCATION IN INDIANA

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In a recent article on the Extent of Chemical Education, Victor H. Noll (1) makes the statement that the first professorship of chemistry in America was established at Kings College in 1767. The next institution to offer chemistry was the University of Pennsylvania in 1769.

Indiana at this time was mostly an unsettled wilderness, and it is not strange that we find no chemical instruction in the state until more than 50 years later.

At the founding of the Indiana Academy of Science in Indianapolis, December 29, 1885, we find a record of a paper presented by Robert B. Warder, then professor of chemistry at Purdue University, entitled "Chemical Work in Indiana" (2). Thirty-one years later, in Indiana's centennial year, Dr. J. H. Ransom, also of Purdue University, presented a paper before the Indiana Section of the American Chemical Society (3) in which he traced the growth of chemistry in Indiana from the beginning of the state to the end of the first hundred years. These two papers were designed to give insight into the growth and development of the science of chemistry in Indiana and to serve as a reference for those interested in the history of the state.

In order to complete this record and bring it up to date, we are now, in 1935, fifty years after the founding of the Academy, presenting a brief sketch of the past hundred years of chemical education in Indiana colleges. The main purpose of this sketch is to present a statistical record which will serve as a reference to show the rapid advancement in the past twenty years.

The history of chemistry in Indiana, as well as all science in the state, probably began when the famous "boat load of knowledge" ascended the Wabash River, and landed at New Harmony early in 1826. As this colony boasted a number of eminent geologists, interested in the composition of minerals and soils, the early development of chemistry in the state was closely related to that of geology. Indeed, much important chemical work was later carried on by some of our state geologists. At this early date we find most of the scientists interested in natural science or natural philosophy in general rather than in chemistry in particular.

Soon after the coming of these scientists to New Harmony, colleges began to be established in Indiana. Hanover College opened its doors to students in 1827, and in 1828 the State Seminary, founded at Bloomington in 1820, was changed in rank to Indiana College. Wabash College was founded in 1832, and instruction began late in the following year. Other colleges soon followed.

The earliest record of chemistry in the curriculum of an Indiana college is 1829, when John H. Harney was appointed to the chair of mathematics, natural and mechanical philosophy, and chemistry at Indiana College. There seems to be no record of what courses were taught (4).

Hanover College mentions chemistry in the list of courses in 1832, and in 1835 one semester of chemistry was required for graduation. Chemistry was a senior subject until 1861. It was not until 1883 that the course here was extended to a whole year, at which time analytical chemistry was added. Two years of chemistry was first offered in 1888.

Chemistry is first mentioned at Wabash College in 1836 when, according to a minute of the Board of Trustees, the appointment of Professor E. O. Hovey was "changed from Rhetoric to Chemistry and Natural Science" (5). At the same institution in 1856 a donation from Chauncy Rose founded the Rose Professorship of Chemistry.

At DePauw University chemistry was taught from 1839 to 1840 by the Reverend Mathew Simpson, President of the University, but no mention is made of the courses taught or the time devoted to the subject. He was followed by Professor W. C. Larrabee, who in turn was followed by Professor C. G. Downey, in 1843.

At Butler University we find the first reference to chemistry in 1858 when R. T. Brown, A.M., M.D., was made professor of Natural Science, Chemistry, Natural Philosophy, Physiology, Botany, Meteorology, Zoology, and Geology.

At Earlham College in 1858 chemistry is listed as one of the subjects taught by Professor Joseph Moore. Whether given at an earlier date, there is no record. There is a tradition at Earlham College that the first course in laboratory chemistry to be offered in the state was given there, and for many years the catalogue carried this statement: "In a room adjoining the present quarters of the Christian Association in Earlham Hall, the first chemistry laboratory in Indiana for the use of college students was located." The catalogue also states in 1864 that second-year chemistry included work in the laboratory. In 1867 a limited course in quantitative analysis was added. In this year Erastus Test was in charge of the chemistry at Earlham College.

In 1836 at Indiana University a building was completed to "furnish additional recitation rooms, library and chemical laboratory". There is no record of when the laboratory was installed (4).

In these early years, courses in chemistry rarely extended over more than a year and often only a semester was offered, usually in the senior year only. Frequently one term was devoted to inorganic and one to organic chemistry. Thus, there was little or no opportunity to specialize. Analytical chemistry could not be given until laboratories were available. These were first introduced about 1865 to 1870, and with this equipment limited courses in qualitative and quantitative analysis could be given. Frequently a term of qualitative analysis was added to the course and sometimes a second term of quantitative analysis when equipment could be secured.

Not until about 1900 did the general application of physics to chemical problems assume importance, and the so-called subject of physical chemistry begin to be developed. It was only after this time that we find courses in theoretical and physical chemistry generally offered. Such courses gave additional impetus to advanced work, and graduate courses increased. Indiana University gave its first master's degree in chemistry in 1890, to R. E. Lyons, now head of its chemistry department,

and Purdue University gave its first master's degree in chemistry in the same year, though it had granted the advanced degree of Analytical Chemist as early as 1878 (6). Rose Polytechnic Institute began instruction in 1883 and graduated the first chemical engineer in 1894. The first graduate in chemical engineering at Purdue University was granted his degree in 1909—eighty-five were graduated with this degree in 1934.

The development of laboratories for instruction and research was slow. In the early days chemistry was usually one of several sciences to be taught by a single professor, and little space or equipment was devoted to it alone. Generally it was housed in a building or department with other sciences. At Purdue University, until 1886 or 1887, chemistry shared the first small building to be erected for instructional purposes on the campus along with art, physics, pharmacy, and all the engineering courses. This building, with additions, was later occupied by the Pharmacy School alone and finally outgrown by it some years ago. It was not until 1907 that the first building designed entirely for chemistry was completed at Purdue University (7).

Wylie Hall, completed at Indiana University in 1884, had one floor devoted entirely to chemistry.

The first full-time professorship in one science at Indiana University, and probably the first in the state, was established in 1874, when Professor T. C. VanNüys was appointed to give instruction in chemistry. Trained in German universities and bringing the European ideals of chemical education to Indiana, his coming marks the beginnings of the real development of chemistry at Indiana University and probably in the state.

About the time at which Professor VanNüys went to Indiana University, Purdue University opened, and Harvey W. Wiley was called to have charge of the chemistry. He immediately set about organizing a chemistry course covering four full years of chemistry. All chemistry beyond the first term was elective, and in the advanced courses laboratory practice was especially stressed. When Professor Wiley left Purdue in 1883 to become chief chemist for the United States Department of Agriculture, the school of chemistry was discontinued, and less chemistry was offered for a number of years. It was not until 1892 that chemistry was again offered before the junior year.

There are a few men whose names should be especially mentioned as having very largely influenced chemical education in Indiana in the closing years of the last century:

T. C. VanNüys, Professor of Chemistry at Indiana University from 1874 to 1895, and first full-time professor of chemistry in that institution;

Harvey W. Wiley, first professor of chemistry at Purdue University and state chemist 1874 to 1883; later internationally known for his work as chief chemist with the United States Department of Agriculture;

Robert B. Warder, who followed Professor Wiley at Purdue University, leaving a few years later to have charge of chemistry at Howard University;

J. U. Nef, Professor of Chemistry at Purdue University 1887 to 1889, and later for many years head of the department of chemistry at the University of Chicago;

W. A. Noyes, Professor of Chemistry at Rose Polytechnic Institute from 1886 to 1903; later chemist in the Bureau of Standards and head of the chemistry department of the University of Illinois 1907 to 1926, and since then Professor Emeritus;

Alexander Smith, Professor of Chemistry at Wabash College 1890 to 1894; Professor of Chemistry at the University of Chicago 1894 to 1911, and head of the department of chemistry Columbia University 1911 to 1919;

W. E. Stone, head of the department of chemistry, Purdue University 1889 to 1900; President of Purdue University 1900 to 1921.

These were small beginnings, but from them chemistry has made a steady and rapid growth until today there are three colleges in the state with laboratories each of which will accommodate approximately 1,000 students, and one, at least, can accommodate 2,500. Additions to this largest laboratory are already planned.

Twenty-one Indiana colleges answered a questionnaire sent out relative to the number of students at present in the chemistry courses. A summary of these answers shows 3,386 students enrolled this year in the beginning courses. In 1935 there were 312 students graduated with majors in chemistry or chemical engineering, and 150 were doing graduate work in chemistry. A total of 29 master's degrees and 15 doctor's degrees were granted during the year. Only 4 of 21 colleges reported that they have regular graduate work in chemistry. In the chemistry departments of these 21 colleges there were 49 professors, 16 instructors, and a large number of assistants, most of the latter being graduate students.

The situation as to chemistry courses given in the various colleges and universities of Indiana can, perhaps, best be shown by tables, and several such tables have been prepared (Tables I and II). Only a summary of these will be given at this time.

There are at present at least twenty-three schools beyond the high school level giving work in chemistry. Allowing for one or two minor exceptions, all the colleges and universities present courses in general chemistry. About one-half of them offer courses in physiological and biological chemistry, and more than half offer courses in methods of teaching chemistry.

It might be noted in this latter connection that there is a very noticeable trend toward checking up on the sort of teaching and examining being done. Emphasis is being directed to the objectively scored type of examination. Some are advocating the importance of less individual laboratory work and more demonstration and explanation of experiments by the teacher. Withal, a critical eye is being cast upon the whole question of teaching chemistry.

Some schools are attempting to distinguish between students who come to them with and without high school chemistry by handling them in separate sections. Approximately 60% of the freshmen entering Purdue University in the fall of 1935 have had courses of chemistry in high school.

In addition to the courses shown in the tables, advanced courses are offered at the four schools giving graduate work, the number of such advanced courses being about 28 at Notre Dame, 31 at Indiana University, and 40 at Purdue University.

TABLE I

The number of credits for courses in chemistry in the several schools listed, as taken from current catalogs.

School	Location	Date of Founding	Approximate Enrollment	General Inorg. Chem.	Qual. Analysis	Quan. Analysis	Organic Chem.	Phys. Chem.	Physiol. Bio-Chem.	Advanced Inorg. Chem.	Methods of Teaching Chem.	Miscellaneous
Ball State Teachers' College	Muncie	1918		8	8	8	8	4	4		4	4 (Special probs.) 4 (Applied Chem.)
Butler University	Indianapolis	1855	1500	10	5	(f) 5	(f) 10	5		5	2	1 (Premedic)
Central Normal College	Danville	1876										
DePauw University	Greencastle	1837	1400	6(c) 10	3(c) 5	3(c) 5	3(c) 10	4	3	2	2	1 (Chem. Ger.) 1 (Chem. Fr.)
Earlham College	Richmond	1837	400	6(c) 8	(d)	6	18	(e) 2-4	3(c) 2-4(e)	4	2	6 (Agr.)
Evansville College	Evansville	1854	300	6(c) 10	5	5	6(c) 10	5	3			
Franklin College	Franklin	1824	300	8(c)	(d)	5	10	5			2	
Goshen College	Goshen	1894	300	6	8	6	2(c) 4			(e) 1-2	2	
Hanover College	Hanover	1827	400	10	4(c) 5	4(c) 5	10	(e) 4-6			2	
Indiana Central College	Indianapolis	1905	400	10	(e) 2-5	(e) 6-10	10	3		3	2	5 (Household)
Indiana State Teachers' College	Terre Haute	1865	3000	4(c) 8	4	8	12	8				4 (Industrial)
Indiana University	Bloomington	1820	4600	10	5	7-11 (e)	8	4	6	4		
Manchester College ^(a)	North Manchester	1889	400	12	4	10	10	4		4	4	5 (Theoretical)

(a)	Marion College	Marion	1920	200	15	5	15	15	3	10	4	5 (Agri.)
	Notre Dame University	Notre Dame	1842	2600	4(c) 6	4	4(c) 8	8	3(c) 10	7		
	Purdue University	West Lafayette	1869	3700	4(c) 6 8	3(c) 8(g)	3(c) 8	6(c) 10	3(c) 4(h)	6(c) 7		
	Rose Polytechnical Institute	Terre Haute	1874	200	8	2	5	9	6			6 (Industrial)
	St. Mary-of-the-Woods College	Terre Haute	1840	200	8	6	3	11	3	4	2	2 (Chem. History)
	St. Mary's College	South Bend	1855	200	10	4	4	8	10	4		2 (Chem. Hist.) 8 (Industrial)
	St. Joseph's College	Rensselaer	1891	150	8	4		8				
	Taylor College	Upland	1846	200	10	5	5	11	5		2	2 (Chem. Hist.)
(b)	Tri-State College	Angola	1884		2	1	2	2	1			
	Valparaiso University	Valparaiso	1859	500	9	2	7-8	8	3	3	2	3 (Industrial)
	Wabash College	Crawfordsville	1832	400	8	4	4	14	4		2	

- (a) Credit hours based on quarter system rather than semester.
 (b) Credit hours listed indicate merely semesters spent on subject.
 (c) Light course and also heavier courses for benefit of those majoring in chemistry.
 (d) Qualitative course included in General course.
 (e) Variable-credit course; credit dependent on amount of work done.
 (f) Additional laboratory work given for those desiring same.
 (g) Divided into regular and rapid-pace sections for the benefit of those having had a good course in high-school chemistry.
 (h) Entirely a laboratory course to be taken in addition to the lecture course if so desired.

The emphasis on research has changed very materially since the situation was reviewed by Mahin (8) in 1920.

Fellowships subsidized by various manufacturers have helped. In some cases such outside connections have led to special organizations to take care of the situation. At Purdue University the Purdue Research Foundation was set up in 1930.

Better equipment and improved laboratory facilities have also greatly aided research, and with this has come also more encouragement and support from administrative officers.

In the beginning of chemistry instruction in Indiana, such a thing as a chemistry library probably did not exist, though text books and an occasional reference are mentioned. Silliman's chemistry seems to have been a popular text, though Roscoe, Stackhard, Elliott and Storer, and Youman are all mentioned. Occasionally a few reference books are mentioned, but the chemical libraries evidently were not extensive. We find in a statement of one college that to the reference books in chemistry there had been added a Webster's Dictionary. As chemistry has steadily grown in Indiana, the demand for reference books has increased until today some of the larger schools have fairly extensive departmental libraries containing not only the best reference books but journals, both current and back volumes. Today the chemical libraries in the state probably represent a fairly good sample of chemical literature, both past and present. In 1931, out of a list of 2,000 periodicals abstracted by Chemical Abstracts, the four ranking libraries of the state are credited with having the following number of these periodicals: Purdue University, 293; Indiana University, 186; Indianapolis Public Library, 115; University of Notre Dame, 96. No attempt has been made to list these journals, as this information can be found elsewhere.

In conclusion, may we not say with all modesty that much is being achieved in chemical education in Indiana today, but may we not also look ahead to advances today undreamed of when the Indiana Academy of Science celebrates its centennial in the year 1985?

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Bibliography

1. Victor H. Noll, 1935. *Jour. Chem. Ed.* 12:475.
2. Robert B. Warder. Title included in list of papers presented at the first meeting of the Indiana Acad. Sci., Dec. 29, 1885. There is no record of its having been published.
3. J. H. Ransom, 1916. *Proc. Ind. Acad. Sci.* 35:389.
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6. *Purdue University Alumni Directory 1875-1934.*
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8. E. G. Mahin, 1926. *Proc. Ind. Acad. Sci.* 36:275.

PROGRAM OF THE SECTION ON GEOLOGY AND GEOGRAPHY

Chairman: C. A. MALOTT, Indiana University

1. *Features of the valley floor of the Wabash River near Vincennes. M. M. Fidler, Indiana University.
 2. Stratigraphic relations of the Merom sandstone, near Merom, Indiana. M. M. Fidler, Indiana University.
 3. Karst valleys. Clyde A. Malott, Indiana University.
 4. Some trends in commercial products. J. E. Switzer, Indiana University.
 5. Ages of the silts in glacial Lake Cynthiana. W. D. Thornbury, Indiana University.
 6. Some problems in glacial drainage in the vicinity of Fort Wayne, Indiana. Fred J. Breeze, Fort Wayne.
 7. The Köppen system of climates. An American academic adaptation. A. H. Meyer, Valparaiso University. (Read by title.)
- The paper by S. S. Visher, on Indiana Regional Contrasts in Temperature and Precipitation, which was presented in the General Session (See Program, p. 9), is published in this section.

*Papers published in this volume.