

THE EARLY HISTORY OF CHEMISTRY IN INDIANA.

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On a centennial occasion, it would be expected that in giving some account of the development of a science, it should cover the whole statehood period of the state. In the case of chemistry, it was still a young science when Indiana was admitted into the Union. I doubt, however, if any one of the members of the convention which adopted the Constitution of Indiana had ever any training, even of the most primitive kind in this science. It is true the makers of our State had views of future educational expansions.

As long ago as 1804, I learn from the history of Indiana University, it was enacted by the Congress of the United States when providing for the organization of Indiana territory that every section numbered 16 should be reserved in each town especially for the support of schools within the same, and in addition to this an entire township in the regions of Detroit, Kaskaskia and Vincennes should be reserved for the promotion of a seminary of learning. In 1816, when the Congress of the United States provided for the admission of Indiana as a State, it was provided that one additional township should also be reserved for the promotion of a school of higher learning. This additional township when located caused the county in which it was placed to be named in honor of President Monroe. The Indiana Territorial Legislature carried out the early purpose of founding an institution of higher learning by providing for the establishment of the Vincennes University in 1806. The science of medicine was also recognized. Of the three professors which at least should be appointed, one was to be a professor of physie.

The original Constitution of Indiana adopted at Corydon in 1816 contained a provision for the improvement of the school lands already granted or which should hereafter be granted for school purposes and in the second section of this provision, it was declared to be the duty of the General Assembly to provide by law for a general system of education, ascending in a regular gradation from township schools to a State University. A state seminary was organized, at least on paper, in 1820, under the provisions of these organic acts. Among the original trustees were David Harvey Maxwell, a brother of my maternal grandfather.

I mention these historical facts to show that it was the purpose of the founders of Indiana to provide liberally as a State for higher education. This provision for state education, however, was not all the advantage which Indiana was to receive. The necessity of an educated ministry led early in the history of the State to the organization of institutions of higher learning, the primary purpose of which was to provide an educated ministry. Among the earliest religious bodies taking practical steps to this end was the Presbyterian Church and as early as 1828 the academy which afterwards became

Hanover College was put into practical working order. The earliest recorded provisions for the teaching of chemistry that I have been able to find in the short time at my disposal is in the first catalogue of Hanover, that is extant, issued in 1833. This catalogue shows that chemistry was taught as a five hour course during the second session of the Junior year, using Mitchell as the textbook. During 1838 this course was transferred to the first session of the Senior year. In 1841 the college year was divided into three terms and chemistry was taught through two terms, the second term Junior and the first term Senior.

Also the first effort to teach agricultural chemistry happened to have been made in Hanover College and I believe this was the first attempt in the State. During the year of my birth, in 1844, in reorganizing the teaching of chemistry, it was recognized with the announcement words "Chemistry and its Application to Agriculture."

In 1849 and 1850, the first records of experimental chemistry at Hanover College are found. The catalogue for the college year 1849-50 has this significant announcement: "Besides the textbook recitations in Anatomy, Physiology, Chemistry and Geology, courses of lectures accompanied with illustrations and experiments will be delivered by Professor Stone." The catalogue for 1849-50 also announces that the laboratory is supplied with the apparatus most necessary for chemical experiments.

I am personally acquainted with the teaching of chemistry in Hanover College for the years 1863 to 1867 inclusive. We had regular textbook recitations and from two to four experimental lectures were delivered by Dr. J. W. Scott each week. As assistants in preparing for these lectures, he took certain young men who had taken special interest in chemistry and who were nearing their graduation. It was my good fortune to assist Dr. Scott to a considerable extent during my Junior and Senior years. I have rarely seen a better course of experimental chemistry in any of the institutions I have attended than was given by Dr. Scott with the meagre apparatus at his command. He had the remarkable faculty of utilizing simple apparatus in the best possible manner. Once every year he made the very difficult experiment of producing a small quantity of that very dangerous explosive, iodide of nitrogen. I never knew him to fail in this experiment. Every year after it had been carefully prepared, the small quantity was taken out of the building to a safe distance and exploded with a long fishing pole to the end of which a little grease had been attached.

During the time that Professor John M. Coulter was teaching science in Hanover, the catalogue makes the announcement that the subjects covered by his instruction were taught by textbooks, lectures, observations, excursions, collections and experiments and that "large and valuable additions have been made to the Philosophical Apparatus, (under which the chemical apparatus was included), Cabinet, Herbarium and Museum."

In the early period of teaching chemistry, Dr. J. W. Scott was by far the

ablest professor of experimental and didactic chemistry at Hanover. He had a most pleasing manner, was clear and explicit in his statements and always interesting in his illustration and experiments. Indeed to Dr. Scott may be ascribed the real introduction of chemical lectures and experiments as a means of instruction.

Under Professor Young, chemistry has assumed the dignity of a science which demands even in a small college the entire time of at least one professor. It is to be expected that in the near future, with its increasing funds, Hanover will have a Professor of Chemistry devoted solely to this one study.

Dr. Scott had a natural aptitude for scientific teaching. He perhaps had not more training than Michael Farraday had. He had Farraday's technique though never was given the opportunity for its development that Farraday had. Dr. Scott came to Hanover in 1860 and remained until 1878. When his son-in-law, Benjamin Harrison, became a United States Senator, Dr. Scott was given a clerical position in the Pension Bureau. On my first visit of any length of time to Washington in January, 1883, I called on Dr. Scott at his office and talked over the old times of the laboratory at Hanover. When Benjamin Harrison became President of the United States Dr. Scott was already a nonagenarian. One day, shortly after Mr. Harrison's inauguration, Dr. Scott appeared in my office in the Department of Agriculture during the morning hours. I said, "Doctor, you are having a vacation today." "Yes," he said, "I have been dismissed from the Public Service." He said this quite solemnly and I, of course, was very much astonished that with a father-in-law as President of the United States such an indignity should have been heaped upon him; and then he went on, with a merry twinkle in his eye, "I have been demoted to spend the rest of my days in the White House." As in most cases of elderly persons who stop an active life, leisure did not agree with Dr. Scott's plan of existence. As might have been expected, he did not live through the Harrison administration. I consider that Dr. Scott conferred great blessings on humanity by his long course of teaching and especially by his aptitude in adapting himself to teaching in a most instructive and interesting way sciences in which he had had no special training.

The first professor of natural sciences in the State University was John Hopkins Harvey. He was appointed a Professor of Mathematics in the State Seminary, which later became the State University, in 1831. When the State Seminary became the College of Indiana Professor Harvey was elected Professor of Mathematics and Natural Sciences. He resigned this position in 1832 to accept the professorship of Mathematics and Astronomy in Hanover College. In 1836 he was made Professor of Natural Philosophy, Chemistry and Geology in Hanover College.

One of the most illustrious of the Professors of the State University was Theophilus A. Wylie. He was appointed Professor of Natural Philosophy and Chemistry and began his duties in 1837. He left the Indiana University

at the end of one year and went to Miami. He returned, however, to Bloomington in 1854. He remained an active teacher in the university until 1886, when he was retired with the honorary title of emeritus Professor of Philosophy.

Professor Robert Milligan taught Natural Philosophy and Chemistry in Indiana University for two years, from 1852 to 1854.

One of the most distinguished teachers of chemistry in early times in Indiana was Professor Richard Owen. Dr. Owen was appointed Professor of Natural Philosophy and Chemistry in the Indiana University in 1863 and held that title until 1867. In 1867 the title of his professorship was changed to Natural Science and Chemistry which position he held from 1867 to 1879. Dr. Owen not only was a distinguished scientist in the general sense of that term at that time but was particularly an expert in geology. In 1873, Dr. Owen was elected as the first President of Purdue University. Before the University was opened, however, in 1874, he resigned, never having entered actively upon his duties.

In the Northwestern Christian University, now Butler College, in so far as its early days are concerned, chemistry was one of the sciences taught by Professor Ryland T. Brown. Professor Ryland T. Brown was a type of the many sided man. A preacher of great renown and power, he at the same time was a devoted student of the sciences as they were known and taught in his day. He was particularly a geologist and taught geology by modern methods. He also was quite accomplished in the theory of chemistry, though not a practical analyst. In the early days of Butler as illustrated by the courses of 1865 which are the earliest that I can lay my hands on, chemistry was taught, in the Sophomore year, 1st and 2nd terms, Silliman's textbook being used. Applied Chemistry was taught in the third term by lecture. In 1868, I became connected with Butler College as an instructor in Latin and Greek and had ample opportunities of observing Dr. Brown's method of teaching science. I joined on more than one occasion his geological excursions with great pleasure and benefit. He was an interesting speaker and knew his subject well but only from the didactic and theoretical point of view. In 1871 Dr. Brown was appointed chemist of the Department of Agriculture.

In the fall of 1875, I was elected Professor of chemistry in Butler College, but held that post only a short time. I fitted up a working laboratory where a dozen or more students could work in chemical problems and this was opened to the students at the beginning of the Fall session of 1873. During this college year, about a dozen young men and women worked at these desks in simple chemical analysis and syntheses. It was, I believe, at that time the largest working room for students in chemistry in Indiana. From 1874 on, chemistry again fell back into the general natural science class. Under Dr. Jordan's professorship, chemistry was taught by F. W. Achilles during 1875. In 1879 Professor O. P. Hay and W. M. Thrasher, Professor of Mathematics, taught chemistry in Butler. The working laboratories were continued when

the college was moved to Irvington and chemistry was taught by Professor Hay for several years.

In 1874 I became Professor of Chemistry at Purdue. I immediately fitted up a laboratory where large numbers of students could be accommodated. As I remember, we had working desks for about 25 or 30. During 1874-75 the students in chemistry at Purdue University, among other things, were taught the making of ordinary chemical compounds as instruction in applied chemistry. A large and very fine collection of these compounds was prepared and exhibited at the World's Fair in Philadelphia in 1876. As far as I know, this was the first chemical exhibit of a college or university at a World's Fair. There may have been earlier exhibits but I have not happened to come in contact with them. At the time I left Purdue in 1883 the working laboratory had become enlarged and more fully equipped and with a larger number of working students.

Among the men who succeeded me at Purdue have been many whose eminence has been acknowledged. Among them were Robert B. Warder, who was one of the first original workers in physical chemistry in this country. He originated the methods of studying chemical reactions by means of their speed and the factors which retarded or accelerated the reaction.

Following him came Professor Neff who as a worker in organic chemistry obtained world wide renown. After a distinguished career at Purdue, he was made head Professor of Chemistry in Chicago University, where he still further distinguished himself until his premature death, the result of overwork. He came to the notice of Purdue University in the following manner. The late Professor Joy of Columbia University wrote to me that he knew a young man whom he had met during his residence in Germany who had distinguished himself most signally in his chemical studies and who was a Harvard graduate and desired to get a professorship in the United States. I called attention of the Purdue authorities to Professor Joy's commendation and in this way Professor Neff came to Purdue. Following Professor Neff, Dr. Stone became Professor of Chemistry. Had he not so signally distinguished himself as an Executive Officer he would be worthy of a place among the stelleri by reason of his researches in agricultural chemistry.

Among the younger men who have taught chemistry in Indiana and who have made a reputation for themselves I desire to call attention to W. G. Emery. He was Professor or Assistant Professor of Chemistry at Wabash for some time. He was appointed to the chemical service of the Bureau of Chemistry after a brilliant examination by the Civil Service Commission, and has distinguished himself particularly in pharmaceutical chemistry in the position which he now occupies.

Among the earlier workers in chemistry in Indiana not connected with didactic institutions I must recall the services of Dr. Levette in the Geological Survey. When I first came to Indianapolis in 1868, I made the acquaintance of Dr. E. T. Cox, the State Geologist and through him of Dr. Levette.

At that period of my chemical studies, I had never seen anyone engaged in a quantitative analysis. I frequently went to Dr. Levette's laboratory in the State House to watch him in what I thought to be the most delicate and scientific work which I have ever seen. He was engaged particularly in the analysis of Indiana coals and did much, in connection with Professor Cox, in the development of the mineral resources of the State. One striking experiment which I shall never forget was the making of a hard and glistening coke. He conceived the idea that if pressure were placed upon a piece of coal which was in process of distillation that the resulting coke would be hard and firm, resembling to a large extent anthracite. He considered that the hardness and luster of anthracite coal were due to the fact that it had been developed under high pressure. By attaching a mercury guage to the delivery tube of the small crucible in which the coal was distilled he succeeded in getting a residue which in hardness and luster very greatly resembled anthracite. Dr. Levette was the first chemist in Indiana who determined the fuel value of coal by quantitative analysis.

The great chemical industries of Indiana have grown up largely since my withdrawal from the State and I am, therefore not able to give from my own knowledge any account of the hundred of chemical workers who must have distinguished themselves in the industries of Indiana during the past third of a century.

Perhaps I may be allowed to refer, as it is a matter which concerns my own activities largely, to the first chemical studies ever made in Indiana in so far as I know on the adulteration of foods. Dr. W. W. Vinnedge was a member of the State Board of Health in the years 1880 and 1881 and perhaps for a much longer period. I had become interested at that time in the adulterations of sugars and syrups and I suggested to him that the State Board of Health make a small appropriation to enable me to study the adulteration of sugars and syrups offered for sale in the State of Indiana. An appropriation of \$50 was made for this purpose. With this money, I collected a great many samples of sugars and syrups exposed for sale in the State and examined them in the laboratory of Purdue University. In so far as I know, the first report on food adulteration of an official character ever published in the State was issued by the Board of Health in the publications of the report which I submitted to them, giving the results of my studies.

I have already called attention to the fact that as far back as 1844, Hanover College had made studies of chemistry in its relations to agriculture. It was at this period that Liebig's work in agricultural chemistry first became generally known and although I have no evidence other than this fact, I feel quite certain that it was the knowledge of the work of Liebig coming to the faculty and trustees of Hanover that led them to make this study.

As a contribution to the history of chemistry in Indiana I must refer to the fact that in 1881 the Legislature of Indiana passed an act creating a State Chemist who was to be the Professor of Chemistry at Purdue University

and defining his duties. These duties were at that time confined to the examination of commercial fertilizers offered for sale in the State with a view of determining whether or not they met the standards claimed. The first official control of foods and fertilizers, therefore, in the State of Indiana must be awarded to Purdue University. I held this position of State Chemist until my retirement from Purdue University in 1883. The duties of State Chemist devolved upon my successor. Subsequently the statute was changed so that the duties of the State Chemist were discharged by the Director of the Agricultural Experiment Station. This list of men who have become eminent in the chemical profession in the Institution of Indiana and its industries is not very large. This is due perhaps entirely to the fact that my absence from the State has put me out of touch with what the chemists have been doing and, therefore, the omissions of many names of eminent chemists is due to my ignorance. To some extent, however, this is not the case. With the exception of the State University and Purdue University, the educational institutions of Indiana are not able as a rule to employ more than one and sometimes not one chemist devoted wholly to that profession. The result is that as the professors have to discharge a multitude of duties in connection with their scientific work they do not become eminent in any one branch thereof. This is no reflection whatever, however, upon the splendid work which these men have been doing for science in an environment which many persons would think very unsuited to fruitful results. It is not always the well equipped laboratory and abundant supplies of reagents that produce eminent chemists. Like poets, they are born, not made. This is brilliantly illustrated in the history, in my opinion of the world's greatest scientist, Michael Faraday. The value of the work which these men have done without gaining world wide reputation for eminence in any particular branch rests as an eternal monument to their devotion to duty and to their skill as teachers.

I cannot close this hurried sketch without calling attention to two or three of the earlier scientific workers of Indiana that I have not yet mentioned and men whom I have had the honor and pleasure of knowing. Among these I mention first Professor Tingley, who was for many years connected with Ashbury, now Depauw University. Professor Tingley was one of those splendid workers who not only had skill but imagination and perhaps had he been able to devote himself to one single branch of science would have acquired wide eminence. I, as a young man, knew Professor Tingley quite well though I never had had the opportunity of hearing him lecture but once. When the question of producing light from electricity was first broached, and this I think was along about 1868 or 9, Professor Tingley, at my invitation came to the High School of Indianapolis to give an illustrated lecture on electricity. He brought with him a large battery made of alternate pieces of gas coke taken from the inside of gas retorts and roughly shaped and zinc plates. This battery he had constructed himself. He put up a number of

large cells, 20 or 30 in all, and properly connected them for developing the electrical current with sufficient intensity of voltage, to make a small arc, bringing the two opposite poles of the battery together by means of carbon electrodes and holding them in his hand with proper insulation, he separated them very slightly and produced a brilliant spark and, when he could hold his hand steady enough, it was a continued glow. This was the first electric light I ever saw. It may not be out of place to add here that the first dynamo ever seen west of the Alleghanys was one purchased by me for Purdue University at the close of the Centennial Exposition in Philadelphia. This Gramme machine is still in good condition and may be seen among the treasured possessions of Purdue University. The first electric light ever shown from a dynamo was shown from the tower of Purdue University about November, 1876. Thus, Dr. Tingley's small spark of light had in six years grown to be a splendid illumination which was cast by means of a reflector from the tower of the laboratory at Purdue on various parts of the city of Lafayette. In the year 1878 I saw the first electric lighted city street, namely, the Avenue De L'Opera in Paris. Thus in eight years, Tingley's spark had grown to illuminate a great world capital. Now as we gaze everywhere on brilliant electric lights we can hardly realize in 1870 they were entirely unknown.

Another scientific worker in Indiana who taught chemistry more or less, although astronomy was his specialty was Professor Campbell of Wabash. His distinguished services to education and science are known to all. It was he who originated the idea of the centennial exposition and who was its permanent secretary.

Professor Hougham connected for some time with Franklin College was another early worker in chemistry in Indiana filled with enthusiasm and who possessed a very great degree of skill in manipulation and experiment. His particular liking was physics but he did much in the early teaching of chemistry.

To undertake to give now the present condition of chemical teaching in Indiana and of the chemical industries would require a book and I shall not venture into this field, entirely too large for illustration at the present time.

It is well in all great fields of investigation to stop for a while and look back to the little beginnings of them all. In this way, we not only get a better understanding of the importance of the early work and the services of the early workers but we also get a point of view by means of which we can estimate the great distance which we have come.

I trust that this brief review of the early history of chemistry in Indiana may serve to impress us with the magnitude of its present proportions and of the wonders which it is doing for the discovery of the unknown and the welfare of humanity.