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DEDICATION OF THE WILLIAM ALBERT NOYES LABORATORY OF CHEMISTRY AT THE UNIVERSITY OF ILLINOIS

By Professor ROGER ADAMS

HEAD OF THE DEPARTMENT OF CHEMISTRY, UNIVERSITY OF ILLINOIS

OUR meeting to-day is to honor Dr. William Albert Noyes, formerly head of this department. This is a rather unusual occasion; first, because there is probably a larger proportion of the graduate students and faculty in chemistry gathered here to-day in a group than at any time since I have been associated with the department, and second, because we are naming a building, one half of which is thirty-seven years old and the other half twenty-three years old.

The older members of the staff know Dr. Noyes and his accomplishments. The younger men who are so busily engaged in their studies toward advanced degrees know too little of him. I shall, therefore, outline briefly his career.

Dr. Noyes was born in Iowa and took his undergraduate degree at Grinnell College in 1879. He then went to Johns Hopkins for graduate work. In those days Johns Hopkins was the leading institution for graduate work in chemistry in the country. There he studied under Professor Remsen, whose name is known to all of you, and received the doctor's degree in 1882. His first scientific publication with Professor Remsen appeared that year.

Dr. Noyes served as instructor at the University of Minnesota in 1882–1883 and then accepted a professorship at the University of Tennessee, where he stayed until 1886. The probability is (though I do not have the facts) that at this institution he acted not only as professor of chemistry, but assistant in the laboratory, purchasing agent, janitor and possibly even stenographer as well. In 1887, he became professor at the Rose Polytechnic Institute, where he remained until

1903. The Rose Polytechnic Institute is considered a small school, but before 1900 it was relatively larger in comparison with the other technical schools of that day. During this period Dr. Noyes devoted his time to teaching and research, with facilities inadequate for either. He had a very heavy teaching schedule and in addition was required to do much of the laboratory assisting and other work of the chemistry department usually assigned to others. The necessity of doing all these things would discourage the average individual. Few men, under such circumstances, are able to get ahead and succeed.

During those seventeen years Dr. Noyes not only wrote two text-books but published regularly the results of his investigations in the field of organic, inorganic and analytical chemistry. Because of his accomplishments he became nationally recognized by all American chemists as an outstanding figure. As a consequence, in 1903 he was called to one of the choicest positions in the country as the first chief chemist of the Bureau of Standards, a position which offered opportunity and facilities for scientific research.

The University of Illinois was fortunate in its choice when, in 1907, Dr. Noyes was selected to head the department of chemistry. He continued in that capacity until 1926, when he became *emeritus*.

After this brief survey of the positions he has held I shall speak of some of his specific accomplishments. Dr. Noyes has written two texts and a laboratory manual in inorganic chemistry, a text-book in qualitative analysis, a text and a laboratory manual in organic chemistry. He has likewise completed significant investigations in the three fields of organic, inorganic and analytical chemistry. Few men have combined such a breadth of knowledge.

His researches include the determination of the atomic weight of oxygen, of hydrogen and of chlorine, the values for which were accepted by the Committee on Atomic Weights. The average of the hydrogen-oxygen ratio which he found is essentially the average of all the other values reported by other investigators. In analytical chemistry he developed methods for the determination of phosphorus, of sulfur and manganese in iron. His earlier researches in organic chemistry were on the oxidation of benzene derivatives with potassium ferricyanide and on the structure of camphor. Dr. Noyes was one of the first to recognize the significance of the electron theory and to apply it to ions. His interest in valence and polarity has continued ever since, and much of his research time in the last twenty-five years has been devoted to this field, in which he has made important contributions. Dr. Noyes's ability as a teacher is demonstrated by the prominent men of science trained under his tutelage.

He devoted much of his energy and ability to the American Chemical Society. Not only did he give unsparingly of his time to the formulation of the successful policies of the society, but he did more than any one else in developing the publications of the society. From 1903 to 1907 he was secretary of the society. He was editor of the *Journal of the American Chemical Society* from 1902 to 1917. Because of his successful editorship this journal became one of the leading chemical periodicals of the world. Dr. Noyes played a major role in the establishment of *Chemical Abstracts* and acted as its first editor. The groundwork which he laid resulted in the *Chemical Abstracts* as we know it to-day, the leading abstract journal of the world. His editorial ability led to his being chosen as the first editor of *Chemical Reviews*. Since 1919 he has been editor of *Scientific Monographs* of the American Chemical Society. It would be difficult to find another individual who has contributed as much to the success of the American Chemical Society.

The importance and significance of his accomplishments can best be recognized by the honors he has received from his scientific colleagues. He holds three honorary degrees; he has been the recipient of the Willard Gibbs Medal, the Nichols Medal and the Priestley Medal. This latter is given every three years by the American Chemical Society to a man who has contributed much to American chemistry. He is a member of the three leading honorary societies open to scientists, the American Academy of Arts and Sciences, the American Philosophical Society and the National Academy of Sciences. The American Chemical Society honored him by electing him to its presidency.

In addition to his teaching, editing and scientific work, he has been interested in many other things and has found time for extensive writing. His articles on international affairs, on economics, on peace and on religion are numerous. Many have been printed in foreign languages.

The facts I have given you are, for the most part, a matter of public record. His value to the chemistry department at the University of Illinois can only be known in full by his colleagues and students. He came here in 1907. In the period from 1890 to 1904 the man at the head of the chemistry department was Professor Arthur William Palmer, a scholar and scientist, who understood how chemistry should be taught and who was an investigator at heart. He was severely handicapped, however. With inadequate housing for chemistry and meager funds for supplies and equipment, he was unable to develop the department as he could have done with better support. He did, however, organize the department in such a way that the stage was set for expansion when the opportunity offered. Dr. Noyes, with his resourcefulness, energy, experience and judgment was able to start the department on a rapid and healthy growth. When he arrived in 1907 the senior staff numbered eleven and the gradu-

ate students seventeen. In 1926, when he became emeritus, there was some seven-fold increase in the number of graduate students and the staff had increased to twenty-five. The graduate assistants had trebled or quadrupled in number.

It is pertinent to point out to the younger members of our group the situation of chemistry in the universities from 1900 to 1922. Among university men chemistry was recognized as one of the basic sciences and its importance was not minimized, but in a state institution of the Middle West it is necessary also that it must be so recognized by the general public (and I include legislators as "general public"). In those days the layman looked upon a chemist as an analyst or a dispenser of drugs. Dr. Noyes, with his doggedness, persistence and insistence, was able to convince the administration of the university that it was essential to have increased funds to expand and build a strong department. He recognized also that he must have efficient staff members. Dr. Noyes found a capable group of men in the department when he came here. Among his colleagues were many whose names are familiar to all of you, such as Professor Edward Bartow, now head of the department of chemistry at the State University of Iowa, Dr. A. T. Lincoln, lately retired as head of the department of chemistry at Carleton College, and the late Professor Samuel Wilson Parr.

Dr. Noyes exercised infinite care in the selection of newcomers to his staff. He received the concerted opinion of many individuals before appointing a prospective instructor. He was able to get capable men, and if they left for better positions he sought just as carefully again to find progressive individuals interested in teaching and scholarly work. The administrative and teaching policies of the department were worked out with equal care. As a result, in 1926 when he retired he had a large department which was recognized nationally and internationally.

If I were to close my remarks here, I would omit an important factor in Dr. Noyes's success, his personal characteristics. He has always been absolutely fair; he instilled confidence into his staff members which resulted in a department cooperative and striving for its success. He showed kindliness toward every one, and never lacked time to help and advise a student or staff member.

In closing, let me say that it is a rare individual whom we are honoring to-day. On behalf of the chemistry department, the administration and the trustees of the University of Illinois, I take pleasure in dedicating this building as "The William Albert Noyes Laboratory of Chemistry." We are all happy in the realization that this name will be associated in perpetuity with the chemistry department of the University of Illinois.

RESPONSE BY PROFESSOR NOYES

I THINK I need hardly say how greatly I appreciate the honor which has been bestowed upon me by the university, and especially I appreciate the honor coming from my colleagues of this department and of the university.

In speaking further I thought you might be interested to know something of the background from which I have grown (I suppose I am justified in saying "have grown") to the position which I have held here. I was a country boy born on a farm near Independence, Iowa. One of my early memories as a small boy was that my mother once had lighted a scrap of paper and put it into a wine glass and then clapped the palm of her hand over the glass and showed how, on account of the rarefied air, the glass was held by the pressure of the air to her hand. That was perhaps the earliest physics experiment that I noticed. After that, I became interested especially in physics and chemistry, though with some interest in other sciences as well. A short time after that when my older sisters were reciting their lessons in natural philosophy (we should call it elementary physics), I always stopped and listened, I was so much interested in what they were saying. Then in the years to follow, with the very few advantages I could find in a country farmhouse, with a few additions from the village drug-store, I began to try experiments in physics and chemistry. I read the scientific books not only in those subjects but in others which were available to me, so that I acquired quite a knowledge of these sciences very early in life. I made up my mind while still quite young to go to college, and I learned the elements of Latin from an older sister. Most of my preparation for college, with the exception of three months in Grinnell Academy, was acquired by personal study by myself without a tutor. I learned the Greek alphabet one day while I was cutting corn. I spent in this preparation and later in college four years in the study of Latin and Greek, for the classical course at Iowa College was very much the strongest and best course at that time. I have never regretted the time spent on those languages and the ability to speak which came in that way and in other ways in the years which followed. As I went on the members of the classical course took chemistry in the junior year. When the class went into the laboratory and lecture room of chemistry I went with them, but from that time on, for the last two years at Grinnell, I spent my afternoons in the chemical laboratory studying qualitative and quantitative analysis.

I paid my way through college by going out each winter to teach a district school for three or four months, keeping up my work in college by studying during the evenings so that I completed the work in Grinnell in four years. Not only that, but for the

work in chemistry which I had done, with a little extra study I received at the end of the four years both the A.B. and the B.S. degrees. The following year I taught in the Academy of Iowa College thirty hours a week. In my spare time I did what I think is properly called "graduate work" in the laboratory. I did some more analytical work, but mostly work of a different type. In fact, when I went to Johns Hopkins in 1881 Professor Remsen looked over my notebook of analytical chemistry and said, "You do not need to study analytical chemistry here"; although the majority of the graduate students who went to Johns Hopkins at that time were required to take a course in analytical chemistry before they began their work for a degree. That work at Grinnell included, among other things, the determination of graphite and combined carbon in cast iron, using an old Liebig combustion furnace of sheet iron and heated with charcoal. I presume I am the only chemist living in America who ever used a furnace of that type.

The second year after graduation Professor Herrick, the head of the department, wished to go back to Yale for some graduate work and I was asked to take charge of the department of chemistry that fall, 1880, which I did, and went on doing some further chemical work in the direction of study myself.

I went to Johns Hopkins in January, 1881. After I had worked for nearly three months, Professor Remsen called me into the balance room one day and asked me if I would undertake a study of the Frankland method of water analysis for the National Board of Health, for we did at that time have a National Board of Health, although it disappeared long ago. This work was done not under Remsen but under Professor Mallet, of the University of Virginia, and through that summer I received from him three bottles daily containing water and other materials, but chiefly water, gathered over the country, especially where there was reason to suspect that the water had caused disease. I made analyses by carefully evaporating with the addition of sulfurous acid to expel carbon dioxide, evaporating to dryness in that way, scraping the residue from the dish, mixing it with copper oxide and burning it in a tube exhausted with a Sprengel pump of my own construction to get carbon dioxide and nitrogen from the residue. The carbon dioxide and nitrogen I measured in a small narrow tube which I had myself made at Grinnell, graduating it with a millimeter scale by the old Bunsen method and which served my purpose better than the Frankland apparatus which had been provided.

I can not dwell further on details. My training in mathematics at Grinnell had been rather deficient, and instead of taking the regular mathematical course in electrical measurements, I took work in experimental physics under the direction of Professor Rowland. Some of you know that he gave to the world the best determination of the mechanical equivalent of heat which had been made up to that time, and also invented, while I was at Johns Hopkins, the concave grating which has proved so useful in the determination of spectral lines. I took my degree in 1882, three years after I had taken my A.B. and B.S. degrees at Grinnell. You would not allow that sort of thing here, I know, after teaching thirty hours a week for a year in the Grinnell Academy and taking charge of the department for a term.

Professor Adams has spoken of my going to Minnesota as instructor. That was my title, but for two thirds of that year my time was spent in making analyses for the Minnesota Geological Survey and I gave only one short course in organic chemistry toward the close of the year. In September, 1883, I was notified by wire that I had been appointed professor of chemistry at the University of Tennessee, where I spent three years. I am always interested, as I look back, to remember that I was the only Northern man on the faculty, and many of my colleagues had been officers in the Confederate army. We got on beautifully together. In many of my classes I had young men with the initials J. D. (Jefferson Davis) or S. J. (Stonewall Jackson). Those were successful years, and I continued during that time the researches on the oxidation of benzene derivatives with potassium ferricyanide which I had begun at the University of Minnesota.

After that I went to the Rose Polytechnic Institute, where I continued for seventeen years. We had there a course in chemistry. I had to give the whole of it, not only general, but analytical and organic, for those who were going into chemistry, and afterwards, also, the thesis work in the last year of the course. I may say that the researches for at least three or four of the theses carried out by seniors under my direction at the Rose Polytechnic were among the important things which I have done in the way of research in chemistry. During those years I also became interested in the atomic weight of oxygen, as we called it in those days, and made a determination which convinced me that the value for the atomic weight was considerably below the 15.96 which was generally accepted at that time. Professor Morley completed his almost lifelong work on the study of the densities of the two gases, and after he had published his results I took occasion to go over my work and concluded that because I had applied a correction in what I was convinced was the wrong way, my results, if properly calculated, were the same, or very nearly the same, as Morley's. I said nothing about it except to friends, nor did I publish anything. I was waiting to do that until I could complete the work. I might add, the opportunity given by the facilities at the Bureau of Standards for doing this work was one reason for my going to Washington from the

Rose Polytechnic Institute. In the new determination my value or the mean of my value and Morley's was about one part in 5,000 different from either. I have just a little pride in the fact that the value which is now most generally accepted in the tables comes a little closer to my value than to that of Morley. His was a fine piece of work carefully done.

Then came the offer here. I first learned, through Professor Parr and Professor Bartow, that the University of Illinois was looking for a head of the chemistry department. They asked me at a meeting of the American Chemical Society in New Orleans to consult with them about a suitable candidate. I, of course, consented and talked with them for some little time. As I talked I saw the possibilities which lay before the head at Illinois and I finally asked if they would consider me. (I learned afterwards that they had undertaken the conversation with the intention of offering me the headship). Then President James asked me to come here and look over the field. I did so. One of the questions which President James asked me was, "Is it possible to build a strong graduate department of chemistry here in the Middle West?" I must admit that I was just a little in doubt, but I did think it was worth trying.

The work here has succeeded beyond my hope and expectation. I wish to repeat what has already been said with regard to the foundation laid here by Professor Arthur W. Palmer, that, to my mind, gives him perhaps more right than me to the honor of having the chemistry building bear his name. Not only that, I had two magnificent colleagues, Professor Parr and Professor Bartow, who stood by me through the years that followed (Professor Parr until the end of my term) and were always with me helping in the work of the department. In addition, the department was so well organized and we had such able men as the heads of the divisions that I could delegate to them a large part of the work being done. The growth of the department depends upon this cooperation between a group of men who worked together and succeeded.

Again, let me thank my colleagues and the board of trustees of the University of Illinois for the high honor which has been given me.

OBITUARY

JOSEPH GRINNELL

FORTUNATELY the editor of SCIENCE requests of me an "obituary notice" of Joseph Grinnell. This frees me from any attempt at a biography, even a sketchy one, of the man.

First, then, as to the great loss to family, friends, the University of California in general and its Museum of Vertebrate Zoology in particular, and to the realm of knowledge to which he devoted his life—the loss to all these is heavy indeed, the more because of its untimeliness. At the very climax of his usefulness general and scientific, one's first impulsion is toward the old fatuous query: "Why? But the second, more deliberate impulsion is toward consideration of the man—his personality and achievements—with little regard for the number of years involved.

Born (February 27, 1877) on the fringe of civilization, of parents both naturalists by innate qualities, what cultural influences would be likely to thwart his naturalistic tendencies?

The father, Dr. Fordyce Grinnell, was a government physician to the plains Indians at Fort Sill in the then Indian Territory. The family moved to Pasadena when the boy was seven years old. Here the home became famous as "The Bird's Retreat."

With maturing years in such a home, these following upon the first years as a frontiersboy with Indian children as playmates, little wonder what happened later.

Graduation from the Pasadena High School, A.B. from the Throop Polytechnic Institute (now the California Institute of Technology) and A.M. and Ph.D. from Stanford were unquestionably important happenings. But his "field work," covering so large a portion of Western North America, from far into Alaska to well into Lower California, judged by the time spent at it, by his publications and by the part it played in his classroom teaching and his guidance of graduate students would, I am sure, warrant a judgment about him similar to that passed by Darwin on what the voyage of the *Beagle* did for him: "The first real training or education of my mind."

Grinnell never sacrificed the scientific study of nature to popular or practical or literary interests. This is shown by the 550 or more published works, several of them sizable books sufficiently technical to satisfy any reasonable demand in this direction; and by the men and women who earned advanced degrees by more or less of their work with him and who now are widely scattered over North America in responsible positions of research, administration, teaching in institutions of learning or in government service. But not for a moment should his interest and efforts in general education and the great matter of conservation be forgotten. Some specific information about these interests are shown by his class work as a university teacher, his leadership in the Cooper Ornithological Club and his editorship of its journal, *The Condor*.

More specific information about his achievements comes from a look at the Museum of Vertebrate Zoology. A half hour's inspection of it by anybody at