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Edward Curtis Franklin

1862–1937

Edward Curtis Franklin, President of the American Chemical Society in 1923, was born on March 1, 1862 in Geary City, Kansas, and died at Stanford University on February 13, 1937, after becoming in the intervening seventy-five years one of America's most honored and best loved scientists.

As a boy, Franklin was definitely not a scholar, though it is easily understandable why the primitive educational facilities of the schools in a frontier society should have had but little appeal when contrasted with the attractions to be found outdoors.

Kansas was in the hands of the Indians until 1854, and Franklin thus grew up in a country which had not yet been spoiled by the ruthless hands of civilization. The eagerness with which he availed himself of his surroundings has been recounted in a brief autobiographical sketch which describes his boyhood pleasures of hunting, of fishing, of swimming in the Missouri (even then it was noted as being muddy), and of collecting fossils from its limestone banks. Seemingly, there was an infinite variety of nuts, fruits and berries to be picked for use and of wild flowers to be admired. His delight in the beauties of the outdoor world, and particularly of the mountains, stayed with Franklin throughout his life.

As a youth, he roamed the hills along the Missouri; as a young man, he climbed the mountains of Colorado and crossed the Alps on foot during a year as a student in Germany. In his Stanford days, he was active in the Sierra Club until his fifties, having by then climbed five peaks over fourteen thousand feet high and many only slightly lower. At sixty-seven, as a guest to the South African meeting of the British Association for the Advancement of Science, his only regret was the inability to climb Kilimanjaro, seen on the return trip at a distance of thirty or forty miles, towering some nineteen thousand feet above the clouds. In later years, his mountain climbing was done with an automobile, and in 1933, he drove to the fourteen thousand foot summit of Mount Evans.

In the last few years of his life, he managed to see again most of the scenic wonders of our land as in 1936 when he drove to Kansas "by way of the Hoover Dam, Zion Canyon, Bryce Canyon, the North Rim of the Grand Canyon, Albuquerque, Santa Fe, and Boulder, Colorado," and thence on a "wild tour of thirteen thousand miles lecturing before groups of defenseless chemists through the Middle West to Philadelphia and Washington, and thence south to Florida and home by way of the southern route." To Franklin, the longest road was always the best if it offered the slightest promise of more interesting views, whether these be new or old.

In the period of 1914 to 1918 when I had the privilege of working with him, it was always Franklin who first succumbed to spring or fall fever and proposed that we play hookey on a Saturday afternoon and run away on our bicycles into the hills back of Stanford. The game which was sought might be dove, quail, or squirrels, or ducks that could be hunted from a "sneak-boat" on nearby San Francisco Bay. The return was

usually empty handed, but the treasured hours spent on these brief, back-to-nature jaunts were always followed by a vigorous and enthusiastic attack on the laboratory problem which had been so rudely abandoned.

At the age of fifteen, Franklin was sent away to a small sectarian college. There he found himself both physically and spiritually starved, and after two months, he ran away. Fifty years later, it still was possible to find schools in that region where the rations in the dining hall might keep a canary alive but certainly not happily singing. It is quite easy to understand that a man, who throughout his life was characterized by the blunt and honest frankness of his language, could hardly be content in a rigid, fundamentalist environment when, even as a youth, he was inclined to be a "free-thinker" and agnostic.

From 1880 to 1884, Franklin was a pharmacist's assistant in Severance, Kansas, where he also ran a small job-printing shop and played a cornet in the village band. It was with no thought of making a new start on an education that he visited his younger brother, then a student in the University of Kansas in the fall of 1884; but once on the campus, the congenial surroundings aroused his interest, and he decided to enroll as a special student in chemistry at the age of twenty-two. During the first three undergraduate years, he did odd jobs around the chemical laboratory and as a senior, acted as an assistant in qualitative and quantitative analysis.

Apparently, he showed promise as a teacher for he was retained on the faculty as an assistant in chemistry from 1888 to 1893, as an associate professor from 1893 to 1899, and became professor of physical chemistry in 1899 which position he held until 1903. However, he was still restless and footloose and felt uncertain about his future. Thus, we find him from 1890 to 1891 as a student in Germany and from 1893 to 1895 at Johns Hopkins where he gained his doctorate. These excursions might be regarded as part of an orderly preparation for a university career if one did not know that much of the year abroad was spent in sight-seeing rather than given over to serious study and had he not again taken leave in 1896 for a one year visit to Costa Rica as chemist and co-manager of a gold mine and mill. The fact is—and he has recorded his doubts—Franklin was still uncertain as to his fitness for the teaching profession. But, there was no such doubt in the minds of his students. As E. E. Slosson, a Kansas alumnus who was one of them, has so succinctly put it, "all of his former students are his friends, and that is more than can be said of most teachers."

Others have described him as relying but very little on books as a means of gaining knowledge but this conclusion is not warranted by the evidence. It is true that in the 1890's, the entire Kansas University chemical library was held in two small cases which were located in the department office and that the number of scientific journals received by the university as a whole was very small indeed. But each journal was impatiently watched for and eagerly read upon its arrival.

The story of the discovery of argon was hardly read when plans to check the separation were made. It is probable that the first samples of both argon and helium to be prepared in America were separated by Franklin. This was certainly true of Dewar vessels and one of the earliest, if not the first X-ray tube which was American made, was prepared for the use of Professor Blake of the Physics Department. He did rely on the written word for information, but the printed description of new and interesting discoveries was not sufficiently satisfying to him. He had to do them with his own hands and see them with his own eyes. (A considerable number of argon- and helium-containing Plücker tubes were prepared at this time and sent to friends and acquaintances in various universities. Franklin was proud of his glass blowing skill, as well he might be; one of his most satisfying experiences was to find on his arrival at Stanford that his gifts to that school had been stored in an exhibit case among other valued items.)

The diligence with which he trained himself in the laboratory arts, the eagerness with which he followed the chemical literature and the pleasure he enjoyed in repeating the more outstanding discoveries of the day offer additional evidence as to the diversity of Franklin's interest in the material world. The things which might be seen and experienced within the walls of a laboratory were now fully as appealing as the outdoor attractions had been to the youth. Like Kipling's Elephant Child of the "Just So Stories," Franklin was filled with the most insatiable curiosity about all things around him throughout his entire life.

However, while this repetition of the work of others was very interesting and satisfying, it did not reveal in him those characteristics which are the essentials of a creative worker. The spark which was to kindle the fire of Franklin's imagination came from one of his students, H. P. Cady. In the autumn of 1896 Cady, as an undergraduate, was working in the regulation course of quantitative analysis. "Observing after a time that the young man was becoming bored with his task, the writer (Franklin), at the time giving instruction in analytical chemistry, proposed to him that he prepare several of the cobalt-ammine salts and confirm the composition of one or two of them by analysis. Some days later with a beautifully crystallized specimen of one of these interesting salts in his hand Cady stated that the ammonia in these and other salts containing ammonia must function in a manner very similar to that of water in salts with water of crystallization. He suggested furthermore that liquid ammonia would probably be found to resemble water in its physical and chemical properties. As a direct conse-

quence of Cady's suggestion has followed all the work done in this country on liquid ammonia."

Franklin promptly ordered a cylinder of liquid ammonia and prepared the Dewar vessels and other apparatus needed in Cady's proposed study of ammonia as an electrolytic solvent. But the ammonia was slow in arriving and before the experiments were started, Franklin had left for Costa Rica. He returned to learn that Cady had found that many salts dissolve in ammonia to form conducting solutions, although the pure solvent still further resembles water in being practically a non-conductor.

These results, obtained with simple apparatus designed and built with his own hands, for the first time aroused Franklin's latent research instincts. No longer was the literature to be searched for interesting experiments worthy of repetition. The facts recorded therein were to be used as foundations for new information to be discovered by himself and his co-workers.

The years from 1897 to 1903 were richly fruitful for the new research team which was soon enlarged by the weaning of C. A. Kraus from the Physics Department. There seemed to be no limits to the work which Franklin's aroused imagination now saw immediately ahead. Typical titles of papers based in this productive period are "Liquid Ammonia as a Solvent"; "Determination of the Molecular Rise of the Boiling Point of Liquid Ammonia"; "Metathetic Reactions Between Certain Salts In Liquid Ammonia"; "Electrical Conductivity of Liquid Ammonia Solutions"; "Concentration Cells in Liquid Ammonia."

In the fall of 1903, this team of productive research men, each outstanding in his own way, was broken up. Kraus had left for M. I. T., Franklin was to go West to Stanford, and Cady was to remain at Kansas for his entire professional career.

Franklin's evaluation of the two junior partners is of interest. He said many times that Kraus was the most skillful glass blower and manipulator in all of the laboratory arts whom he had known. I dare to question the first part of this opinion; Kraus might equal but certainly could not excel Franklin as an artist and artisan in the designing and working of the old German soft glass. Chemists of today who are accustomed to placing a piece of cold Pyrex tubing directly into the flame of an oxygen-gas blast lamp can have no appreciation of the problem involved in the construction of one of the intricate cells used in some of the ammonia work. The patience of Job and the manipulative skill of a master were needed and these Franklin had.

The later research record of Kraus speaks for itself; an outstanding pupil graduated into an outstanding and productive research professor.

Cady was rated by Franklin as his most brilliant student and co-worker, and we believe that this was a fair evaluation. However, it is worthy of note that his most productive and active research years were spent under Franklin's stimulating guidance.

In 1903, Franklin left Kansas for Stanford University to fill the chair of organic chemistry left vacant by the death of Professor Richardson. Stanford was a rich school in those pre-earthquake days, and David Starr Jordan was adding outstanding research men to his faculty when he could find them. The change was a happy one. Franklin had been preceded in his western journey by several Kansas friends, and one of these, Vernon Kellogg, was instrumental in persuading him to accept the Stanford offer. The university lay in a beautiful setting. Rolling foothills which began at the edge of the campus soon merged into the coastal mountains and beyond these lay the Pacific Ocean only twenty miles from the university. While the Coast Ranges were comparatively low, the higher and much more rugged and scenic Sierras were only a hundred miles to the east. We can be sure that to Franklin, not the least of the attractions of this western wonderland were the mountains which he loved so well.

While Franklin's work at Kansas was more spectacularly interesting, because of the greater emphasis placed on physical-chemical measurements, the purely chemical work which was largely done at Stanford was much the more important. To quote Alexander Findlay, "From their earlier experiments . . . Franklin and his collaborators were led to an exhaustive examination of the parallelism between the chemical behavior of derivatives of ammonia dissolved in liquid ammonia and the behavior of derivatives of water, aquo-compounds as Franklin called them, in aqueous solution. The investigation of the behavior of the former class of compounds, the ammono compounds, to use Franklin's nomenclature, constitutes the chief and most characteristic contribution of Franklin to chemistry."

The record of this contribution is embodied in his monograph on the "Nitrogen System of Compounds." In this, his detailed classification, of the organic compounds of nitrogen as belonging to the ammonia system, has made the book a classic and a most stimulating guide to further investigations by others. Franklin wrote slowly and most painstakingly; hence this monograph was rewritten many times and was over ten years in preparation.

The step by step reports of progress in his forty years of research are contained in eighty-seven papers of which less than half bear his name due to his generosity toward the pupils who were his collaborators.

Franklin, as we have seen, was a great experimentalist, and the few who were fortunate enough to be accepted by him as a collaborator will insist that he was without a peer as a teacher of graduate students. Every one of these men acquired a

skill in laboratory technique which was far above the average, each learned to think independently and, in addition, learned to view his own experimental results with that critical skepticism which is the true measure of a scientist.

His lectures in organic chemistry were models of clear and orderly thinking though Franklin never acquired the smooth and polished delivery which was characteristic of Stieglitz. His own experimental interest and belief in teaching by example made his lectures unusually instructive because of the many elaborate and skillfully done demonstrations which illustrated them.

He had an infinite capacity for making lifelong friends, and these were of all ages from babes in arms to emeritus professors. The Christmas lectures which, like Faraday, he enjoyed giving to the children of his friends and colleagues were elaborately illustrated with demonstrations to fit the occasion and the audience. (I dare say that many a middle-aged matron of today has in her jewel box a glass ring, with a "red" stone, which was made by Dr. Franklin just for her during one of these lectures.)

To the end of his days, he was a welcome and honored guest in the home of every former student and associate in this and other lands. He delighted in talking of his own work and pleasures and equally enjoyed listening to the exploits of others.

From the beginning of his professional career until the year of his death, he was a regular attendant at meetings of the American Chemical Society, and of all the honors that he received, he valued his election to the presidency of this society the most highly.

His wife, Effie Scott Franklin, who was a student at Kansas at the time of her marriage in 1897, died in 1931 and the older of two sons, Charles Scott Franklin, was killed in an airplane accident in 1928. The two surviving children are also worthy of their parents. Dr. Anna Franklin Barnett is a happy wife and mother and a practicing physician as well. John Curtis Franklin, an electrical engineer, is now Manager of Oak Ridge Directed Operations for the Atomic Energy Commission.

HOWARD M. ELSEY

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