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EDWARD BARTOW

1870–1958

After the massacre of St. Bartholomew in 1572, a member of the Britanny Huguenot family of Bertaut migrated to England. Its descendants established themselves at Crediton, near Exeter, and adopted the name Bartow. One of the family, the Reverend John Bartow, a student at Christ's College, Cambridge, was to emigrate to the United States where he established a church which is now a national monument at Eastchester, New York.

After six generations of ministers, doctors and farmers, Edward Bartow, 48th president of the American Chemical Society, was born January 12, 1870 at Glenham, New York. His birthplace is the present site of the great Beacon research laboratories of the Texas Company. His father, Charles Edward Bartow, was head bookkeeper for the local woolen mills. His mother, Sarah Jane Scofield, also came from a long line of English forebears. A graduate of the Poughkeepsie Female Seminary, she taught her son until he was ready to attend the Glenham School and later the Mount Beacon Academy at Fishkill Landing.

Stimulated by the life of President Garfield, young Bartow chose to go to Williams College, which he entered in the fall of 1888. He was already over six feet in height but weighed only 117 pounds. Those were the days when higher education required five and a third years of Latin and four and a third years of Greek as the combined preparatory and college task. While a third of his class elected the classics, Bartow was in a decided minority, for mathematics and science were his first choices.

Undoubtedly the turning point of his career was a course in chemistry offered in his junior year by Professor Leverett Mears. In this same class of 1892 were Charles Albert Browne and Lauder W. Jones. Not for many years could any university, large or small, boast of a single chemistry class with three such promising students.

Browne, the eminent chemical historian, has recorded that those were the good old days when the students had to carry in water from a hydrant in the school yard and what are now closets in the older dormitories were the coal bins to which each student fetched his own fuel. Practically all laboratory equipment was either self-constructed or was imported duty-free by educational institutions. Thus there was little incentive for American manufacturers of apparatus or reagents.

The end of college culminated in Bartow's election to Phi Beta Kappa and two offers to remain at Williams as an assistant in either mathematics, a subject which he greatly enjoyed, or in chemistry. He chose the latter, of course, and his earliest interests were in water analyses—a special field in which he was to earn a lasting reputation as a pioneering authority.

Again it was Professor Mears who interested his young assistant in the desirability of continuing his education abroad. His choice was Göttingen, where Mears himself had received his Ph.D. for his work with Wöhler. Arrangements were made for Bartow to enter Göttingen for study under Otto Wallach, who was later to receive a Nobel prize for his research on terpenes. There by steady perseverance, Bartow completed the required laboratory work for the doctorate thesis in fourteen months. Meanwhile he attended lectures in physical chemistry by Professor Nernst, in mineralogy by Theodor Liebisch, in physics by Rieke, as well as

those in inorganic and organic chemistry by Otto Wallach.

Bartow's thesis dealt with a variety of derivatives of *meta*-isocymene. In those days it was important to calculate the angles of each crystal form of a purified compound. Having studied spherical trigonometry as an undergraduate, the student was able to make these calculations himself—much to the amazement of his German professor. Later when his diploma was awarded, it was accompanied by a special "besonders lob" for the excellence of his laboratory work.

A few days after his return from Europe, Dr. Bartow married Alice Abbott of Rochester, New Hampshire, on September 3, 1895. Together they went to Williamstown to remain for the next year and a half. Mrs. Bartow had studied at Wellesley and taught mathematics at the Williamstown High School. Their daughter Virginia, now on the staff of the University of Illinois, was born shortly before her parents were to move to the University of Kansas.

In February, 1897, Professor E. C. Franklin of that institution had been granted a leave of absence to work as a chemist for a mining company in Costa Rica. The chancellor wired Dr. Bartow that there was an opening for an instructor at $600 per year but also a strong possibility that this would develop into a permanent and more remunerative position. He immediately accepted the challenging offer and joined the small but enthusiatic chemistry faculty at Lawrence.

"Teaching organic chemistry was a delight," he wrote later, even though at the beginning it was done in a large open room in an unfinished chemistry building. The laboratory had no flooring and his office furniture consisted largely of wooden packing boxes that had survived the trip from Germany. Bartow's zealous students assigned and labelled parts of the professor's office: "Analytical Laboratory," "Petroleum Research," "Organic Combustions," "Water Chemistry." There was a barricaded corner for "Dangerous Distillations," a "Store Room" and even a small niche called the "Spare Room." Thus was indicated the diversified responsibilities of the young professor.

The next eight years in Kansas were to bring even broader and more rewarding experiences. With the U. S. Geological Survey he examined the waters of southeastern Kansas. He was appointed by the Governor to inspect the coal mines of the region in order to determine the cause of a series of disastrous explosions. He began a systematic survey of Kansas petroleum during which he located the famous gas well with the non-combustible gas. This gas was later analyzed by H. P. Cady and D. F. McFarland, who discovered that it contained a high concentration of helium.

Bartow's accurate and authoritative analytical work saved considerable money for the University and for a number of outside clients. Modest fees from the latter were sufficient to build a summer cottage at Douglas, Michigan, where for the next 60 years he was to find some measure of recreation and relaxation.

In the summer of 1901, Dr. Bartow studied briefly under Emil Fischer in Berlin. On his return he was invited to give the chemical lectures to the students at the Kansas City Medical College. Each Saturday morning for the next three years he travelled by train from Lawrence to Kansas City to give two lectures and supervise the laboratory work of the pre-medical students. From these Kansas associations came many of his life-long friends.

Outstanding among his eager students and faculty collaborators were O. F. Stafford, who was later to be head of chemistry at the University of Oregon, D. F. McFarland, dean of the School of Mines and Metallurgy at Pennsylvania State College, E. V. McCollum, professor of biochemistry at John Hopkins, O. T. Rees, chief chemist for the Santa Fe Railroad, Fred J. Bates, chief of the carbohydrate section of the U. S. Bureau of Standards, Fred Porter of the Fort Worth Laboratories, P. C. Jeans, head of the department of pediatrics in the medical school of the State University of Iowa and Walter Cross, who developed one of the first successful processes for cracking petroleum. These are but a sampling of Dr. Bartow's great capacity for making friends—perhaps the single most outstanding characteristic of his long career.[1]

A new and most important chapter in Professor Bartow's life began with the call in 1905 to the University of Illinois to serve as director of the Illinois State Water Survey, which had been founded ten years before by Professor A. W. Palmer. He was at the same time appointed an associate professor for one year following which he became the professor of sanitary chemistry.

During his years as director of the Illinois State Water Survey he developed an excellent reputation for outstanding public service. He was a leader in the campaign to combat typhoid fever by insisting on and helping develop pure municipal water supplies. Without charging any fees, the Survey contributed advice on water problems and made routine chemical and sanitary analyses for municipalities, water companies and private citizens as well as the public schools and state institutions. Visits made by its chemists and engineers were cordially received throughout the entire state. Resulting from this work are fourteen volumes of bulletins and annual reports on Illinois waters which even today are classic references for progress and achievements in sanitary chemistry.

In 1914, while in England, Dr. Bartow inspected the recently discovered activated sludge process for sewage treatment, then being studied by Professor Gilbert J. Fowler at the University of Manchester. After his return to Urbana he and his associates devoted several years to the successful development of the process. Their tests began with bottles. Then a box about nine inches square and four feet high was fitted with a porous ceramic plate through which air could be blown into the column of sewage. The box was superceded by concrete tanks four feet square and eight feet deep. Here under Professor Bartow's direction were conducted the first successful large-scale acti-

(1) Although Professor Bartow left an uncompleted autobiography of 327 pages, a rough estimate would allot fully 75% of its content to the accomplishments of his friends, classmates, and colleagues—indeed to all the people with whom he worked. (S.D.K.)

vated sludge experiments in the United States. A bronze plaque to commemorate this achievement has been erected in the grounds of the Champaign–Urbana Sanitary District. Today, this most widely used process of sewage treatment has resulted in enormous savings. Not the least of these is the annual sale as fertilizer of more than 100,000 tons of the purified sludge.

The treatment of industrial wastes for the prevention of stream pollution was always of prime concern to the Survey. Successful processes were developed for the disposal of wastes from starch works, canning plants, meat packing and other food factories. These were described in authoritative articles by the director and by his many co-workers.[2] Included among the latter are F. W. Mohlman, W. D. Hatfield, F. W. Tanner, E. R. Greenfield, W. F. Langlier, H. P. Corson, G. C. Baker, L. I. Birdsall, Frank Bachmann, C. K. Calvert, W. D. Collins—to name but a few of those on the roster of the Illinois State Water Survey during the Bartow Regime.

Time out for War Services.—Shortly after the United States entered World War I, ACS President M. T. Bogert and Secretary C. L. Parsons were asked by the War Department to nominate a small group of chemists to work with the Sanitary Corps in France. Professor Bartow was selected to head the Task Force that included Reston Stevenson of CCNY, George Scatchard of MIT and Ralph L. Brown of the Bureau of Mines. Following an interview in Washington with Professor Victor Grignard, it was agreed that first attention should be given to the chlorination of water supplies for Army camps and field forces.

Commissioned as a Major in the Sanitary Corps, Dr. Bartow was assigned to work with Prof. Louis Lapique and Rene Legendre on the difficult problem of sterilizing Seine River water then used as a non-potable supply for the city of Paris. They soon found a practical solution by using extraordinarily heavy chlorination followed by treatment with sulfur dioxide to remove the excess chlorine.

In January, 1918, Colonel F. F. Longley of the Engineers Corps and Colonel J. F. Siler of the Medical Corps asked Major Bartow to organize water analysis laboratories for the entire American Expeditionary Forces. At the end of the war, there were 11 such laboratories in the Service of Supplies and many mobile units with troops, all under jurisdiction of the Sanitary Corps. After the war the officers and enlisted men in this service overseas fostered annual reunions at meetings of the American Water Works Association. They called themselves the "Service des Eaux" and had but one commanding officer, the now Lieut. Col. (ret.) Edward Bartow.

Iowan Interlude.—Shortly after his return to Illinois, Dr. Bartow was invited to become head of the Department of Chemistry and Chemical Engineering at the State University of Iowa. This was a challenging opportunity not only to organize a department of his own, but also to help design and build a new building for which $400,000 had been appropriated by the State Legislature. Here Professor Bartow's long experience at Williams, Kansas and Illinois stood him in good stead. Largely through his efforts this Iowa building proved a model of efficient yet economical construction. At a time when two other universities spent $1.00/cu.ft. and $1.85/cu.ft., respectively, for their new chemical laboratories, the quivalent Iowa structure cost but 37 cents/cu. ft.

When Dr. Bartow went to Iowa in 1920 there was a senior chemistry staff of seven, with fourteen assistants of whom nine were undergraduates. Only four Ph.D. degrees had been granted. By 1940, when he retired, two hundred and forty doctorates had been awarded in chemistry or chemical engineering and there were over a hundred graduate students in the department.

Because the University of Iowa expected its retired professors to continue on a half-time basis, Dr. Bartow had several graduate students studying with him until he was well over eighty. He always maintained a huge correspondence, kept up with his journals and showed an active interest in all of his many scientific, professional, civic and social organizations.

His autobiography lists memberships in 41 societies, clubs and fraternities—not to mention six national and international societies devoted to his life-long hobby, philately. These memberships were not casual or indifferent. He believed that organizations were worthwhile agencies for inter-communication and progress. He held office in many of them and thanks to his seemingly boundless energy, attended hundreds of meetings, sometimes half way around the world.

While still at Williams, Dr. Bartow helped petition and organize a chapter for his social fraternity, Theta Delta Chi. He served the same function at Illinois in 1908. While there he was also one of the petitioners for the University of Illinois chapter of Phi Beta Kappa and was later president of the Iowa group. He sponsored the petition for Alpha Chi Sigma at Iowa and helped finance the purchase of its house. He was made an honorary member of Phi Lambda Upsilon while at Illinois. As a member of Sigma Xi he served as secretary at Kansas and Illinois and was president at Iowa. Election to honorary membership in Tau Beta Pi pleased him immensely for it was primarily a recognition of his work as a chemical engineer.

Dr. Bartow never believed that an academic man should seclude himself from civic activities. He joined the Merchants Club in Lawrence, Kansas, the Associations of Commerce in Champaign–Urbana and in Iowa City. As a loyal Rotarian, he rarely missed a week's attendance. At ACS meetings, he and his friends, Harrison Howe and Gustavus Esselen, often spirited themselves away from committee meetings in order to keep up their luncheon records.

The Chemists' Clubs of New York and Chicago provided frequent opportunities for renewal of friendships and introduction to new friends. A breakfast acquaintance with T. R. D. Duggan led to establishing the first research and testing of

(2) In all, more than two hundred signed articles, books and reports are included in the annotated bibliography of publications by Edward Bartow. (Editor)

Permutit water softeners in the United States. Later through Dr. Duggan, Dr. Bartow became well acquainted with Professor Gans, who had originated the base exchange zeolite process in Germany and with Herbert Pain of Phillips et Pain, who was largely responsible for its development in France and England. Bartow's long association as a consultant for the Permutit Company, and the post-retirement year he spent with the Johns–Manville research laboratories in New Jersey were often cited as unanticipated dividends from these investments in society dues and assessments.

But of all the professional and scientific societies, certainly the American Chemical Society came first with Dr. Bartow. He joined the small 22-year old society when it had less than two thousand members and he remained a member for 62 years. He was himself convinced and helped convince many others that active participation in the work of the society was a rewarding responsibility for all members of the chemical profession.

Professor Bartow held many Society offices, locally and nationally, and finally was elected its President in 1936. He was first appointed an abstractor for the Water Section of *Chemical Abstracts* in 1911 and served faithfully in that capacity until the day of his death.[3] He was instrumental in the founding of the Division of Water, Sewage and Sanitary Chemistry and served for three years as its first chairman. During his presidency of the Society he re-instated the committee on accrediting of educational institutions, aggressively promoted the membership requirement for more experience, and urged the initiation of student affiliate chapters. His last official act as a director was as one of the signers of the Federal Charter. Characteristically he was proud to be a member of that history-making group.

Professor Bartow's interest in the International Congress of Pure and Applied Chemistry was of long duration. In 1912 he attended the Eighth International Congress in New York and Chicago, recalling the interest (and skepticism) generated by Fritz Haber's papers on his synthetic ammonia process. Troubled times prevented another meeting until 1934 in Madrid, where Dr. Bartow attended the IXth Congress and was made a corresponding member of the Spanish Chemical Society. He went to Rome for the Xth Congress and was in New York for the XIth, held at the time of the Seventy-fifth Anniversary of the American Chemical Society.

The International Union of Pure and Applied Chemistry, of which he was vice-president for the United States from 1934 to 1938, met more frequently. He was a member of the American delegation called on to help re-organize the Union in Paris in 1918. He was appointed a representative at the Lyons meeting in 1922 and during the next thirty years he attended sessions at Bucarest in 1925, Washington 1926, Warsaw 1927, The Hague 1928, Liege 1930, Madrid 1934, Lucerne 1936, Rome 1938, Amsterdam 1949 and New York in 1951—a truly remarkable record as an ambassador of American chemistry!

While in Paris during the war, Dr. Bartow was invited to the organization meeting of the Société de Chemie Industrielle and later joined L'Association de Chemistes. He had long been a member of the American Section of the Society of Chemical Industry.

The Society of American Bacteriologists appointed him to serve on the publication committee that established *Bacteriological Abstracts*, later merged with *Biochemical Abstracts*. As a member of the American Public Health Association he was chairman of its laboratory section and supervised several editions of its "Standard Methods of Water Analyses."

Two engineering societies in which Edward Bartow took an active part are the American Institute of Chemical Engineers and the American Society of Civil Engineers. He served the former as a director from 1923 to 1925. Qualified through his consulting work, he became a member of the sanitary engineering division of ASCE, served on its executive committee for five years and was its chairman for two years.

Directorship of the Illinois Water Survey led to active participation in the affairs of the American Water Works Association, first as a trustee and vice-president and in 1922 he was elected its president. He watched this organization grow from seven hundred members in 1907 to more than twelve thousand in 1958. Other organizations in which he took less active interest included the American Association of University Professors, the American Society for Engineering Education, the National Institute for Social Sciences, the American Legion and the Armed Forces Chemical Association.

During his lifetime Professor Bartow received many honors. The French Government awarded him the *Medaille d'Honneuer des Epidemies d' Argent* for his contribution to the welfare of the French people. He was given the honorary degree of D.Sc. by William College in 1923. Several societies honored him with life memberships.

From 1870 to 1958 was a long span. Characteristically he never ceased to remark with wonder and amazement about the achievements of science and technology he had witnessed in his life time. He traveled the world with eager curiosity about natural phenomena. He never missed an opportunity to examine methods for water supply and sewage treatment—whether it was the 204-ft. well drilled in solid rock at Orvieto, the purification of the Arno at Florence, the water problems in Panama or the great springs in New Zealand. His friends recall a typical experience during an excursion of American chemical engineers aboard the beautiful white steamer that belongs to the City of Glasgow. While an elegant lunch with highland dancing was held on the upper deck, Dr. Bartow discovered that the hold of the vessel was being used to carry the city sewage out to the

(3) Much to his disappointment a minor illness had prevented his attendance at the Spring meeting in San Francisco. Instead he settled back in his easy chair to read some of the journal articles sent him by Editor Crane of *Chemical Abstracts*. Here he peacefully passed away on April 12, 1958. (S.D.K.)

Irish sea. The sanitary chemist was, of course, delighted to report to his fellow travelers on this unique method of sewage disposal practiced by the thrifty Scots.

During all his active life Dr. Bartow was blessed with good health and tireless energy. All his life he walked to his office. A little over a month before he died, when it was five degrees below zero and the snow was eight inches deep, he reluctantly decided to call a taxi. When told that it could not come for fifteen minutes, he said he was "to busy to wait" and so as usual he walked to work.

John Bailar likes to tell of Dr. Bartow's favorite recipe for "getting a kick out of life." Instead of celebrating his birthdays by blowing out candles, he preferred to celebrate his each year by proving he could kick as high as his head. An illustrated article in the *Iowa City Press-Citizen* of January 13, 1950, reports that while for some life may begin at 40, Professor-Emeritus Bartow was still going strong at 80. As he swung his left leg up to the six-foot mark, he is reported to have said "You can't get a kick out of life unless you put a little kick into it!"

Only at 84 did he decide of his own volition not to climb ladders to take care of the screens and storm windows. At 86 he gave up shoveling snow. During the summer of 1957, at the age of 87, he split about a cord of wood at his summer cottage. Swinging his faithful axe above his head, he always brought it down in the self-same groove. Perhaps this is typical of the man—his strong, steady purpose, knowing what he wished to do and continuing to do it.

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