

A BRIEF HISTORY OF CHEMISTRY IN THE OKLAHOMA AGRICULTURAL EXPERIMENT STATION

1892-1972

JAMES E. WEBSTER

The Department of Biochemistry and Molecular Biology has its origin from the first chemist hired in the Oklahoma Agricultural Experiment Station in 1892. Dr. James E. Webster joined the Department in 1927 and retired in 1968. He served as an Assistant Dean in the College of Agriculture for another five years after he retired as a Professor of Biochemistry.

The idea of having Agricultural Experiment Stations developed in Europe and spread to this country around the middle of the 19th Century. The first State Experiment Station was established in 1875 in Connecticut, although there were earlier programs of experiments at a few agricultural colleges. There was a Professor of Agricultural Chemistry at Yale in 1844.

The Oklahoma Agricultural Experiment Station was established on December 25, 1890. The first director was Dr. James C. Neal, who became Director on August 14, 1891. A staff was formed in 1892 and George L. Holier was selected to be the first Chemist. He was one of the four original staff members; he was also farm superintendent.

The first chemistry laboratory was erected with part of an initial building appropriation of \$5,000. It was a small frame building located southeast of the site for Old Central. The cost was approximately \$1,700. At this time starting salaries for staff ranged from \$720 to \$900/year. Student labor costs were 10-15 cents an hour.

Later, after Old Central was built, the chemistry laboratories were moved to the basement of this building. Dr. LeRoy Fischer tells me that the plans for the restorations of Old Central as a museum call for placing chemistry laboratories in the basement. Around 1900 a new chemistry building was built and the Station Chemistry was moved into it from Old Central. In the meantime John Fields and A. G. Ford had been appointed Associate and Assistant Chemists. In 1899 John Fields was appointed Chemist and Experiment Station Director. Holter apparently became disassociated with the Station in 1898 but he continued as head of the Department of Chemistry until about 1908. This Chemistry Department faculty also included some Station staff members. All students were required to take at least two years of chemistry and in the science curricula most took four years. In 1907, the name of the Department of Chemistry was changed to Department of Chemistry, Metallurgy and Mineralogy. Chemistry as such was listed again in 1910, and Professor Ford was also listed as meteorologist. Feed,

fertilizer, and mineral analyses (inspection work) were added as services in 1905 to the Station work.

Morrill Hall was completed in 1906 and Agronomy, Animal Husbandry, Horticulture and Station Chemistry were located in it. In 1908 certain agricultural departments were granted permission to offer M.S. degrees. In 1914 a fire destroyed the interior of Morrill Hall and Station Chemistry moved back to the Chemistry Building, where it remained until it moved into Whitehurst Hall in August of 1926. There the area allotted to Agricultural Chemistry was the extreme west end of the third floor, not including a classroom, which, however, was soon occupied by the Department.

Over the years many personnel changes occurred, and in 1908 there was only one Chemist listed for the Station, a Mr. R. O. Baird. In 1910 Dr. Charles Francis became Station Chemist. He was the first Ph.D. to be so listed in Agricultural Chemistry. In 1917 Dr. C. T. Dowell Over the years gradual increases occurred in the floor space available until finally the Department occupied offices along the south side of the third floor of Whitehurst Hall and both the east and west ends of the third and fourth floors. (Parts of the east end were acquired for use when the Agronomy (soils) Department moved out into a new Agriculture building.) The fourth floor was added to Whitehurst Hall after an explosion in the tunnels under the first floor in 1936. At first the Department was blamed for the explosion but it was soon traced to leaking gas pipes. The east end of the fourth floor was assigned to the Department in 1959. The ever-pressing space problem was relieved for a while when the Department was moved to the new Physical Sciences Building in 1965, where all but one of the laboratories of the fourth and fifth floor were occupied. Now this once adequate area is again crowded.

Dr. Robert MacVicar who joined the staff in 1947, became Head of the Department in 1949, Dean of the Graduate School in 1953, and Vice-President for Academic Affairs in 1957, retaining the latter two positions until he resigned in 1964. During 1953-64 he

retained the title of Professor in the Department. During the 1950s the number of faculty was greatly expanded. Shortly after Dr. MacVicar became Head, discussion began on granting an undergraduate degree in Agricultural Chemistry. The first such degree (B.S.) was issued to Carl Caskey in 1955, although Richard Underwood graduated in 1954 with an A.B. that was essentially an Agricultural Chemistry degree. Since that time, persons received the B.S. degree through spring 1972 and there are now 37 undergraduate students majoring in biochemistry. Through 1971 there were issued 139 M.S. degrees and 72 Ph.D. degrees. These were designated as Chemistry degrees until the summer of 1969, when some were listed as Chemistry degrees and some as Biochemistry degrees.

In 1970 all such listings were in Biochemistry. Around 1968 authority was secured to offer the B.S. degree in Biochemistry in the College of Arts and Sciences also, and the first degrees there were granted in 1969. Dr. LaVelle Henderson came in as Head in 1957 and Dr. Roger Koeppel joined the Department in a couple of years, becoming Head in 1965 when Dr. Henderson resigned. In the decade, 1960-1970, eleven permanent members were added to the staff and at the present time (1972) eight of these are still here. Currently the Department consists of 15 active tenured staff, one Instructor and one Emeritus Professor. The names of the Department and degree programs were changed from Agricultural Chemistry to Biochemistry in 1958.

In the last two decades (1950-1970) there has been a marked increase in the number of graduate students and in the 1960's a significant number of post-doctoral personnel joined the Department as Research Associates. In 1971-72 there were 15 Research Associates and 56 graduate students. Most of the students were supported by the Agricultural Experiment Station.

The previous section dealt mainly with the staff, physical facilities, and overall programs. This part will be concerned with some of the earlier research and later teaching programs.

The first Station bulletin (a general one) listed such functions as water analysis-and indicated that the main lines of research were in chemistry, soils (chemistry), horticulture, feeding experiments (Jointly with chemistry), and entomology. There was a large turnover of Station staff during the early years and in 1897, only the Chemist had been with the Station over one year. In 1893 Bulletin No. 5 listed soil analyses by Holier and Neal and a later Bulletin No. 7 by Holier reported many water analyses. At this time the chemist(s) were analyzing water for irrigation, doing digestibility work with kaffir, and running many routine tests for other persons. In 1897 the fertilizer

value of castor bean plants was studied (Bulletin 25) and irrigation waters were further studied (Bulletin 27).

In 1899 two of the seven Station staff were chemists who also had teaching responsibilities. In the 1900 report note was made that the chemists were being asked to make too many analyses. Some 500 requests for analyses were received from 1891 to 1900 including several for gold and silver. About 1900, charges began to be made for analyses. In these years the cost of chemical supplied for Station Chemistry ranged from \$1,200 to \$2,000. In 1899 Oklahoma-grown sugar beets were tested but they were not of high quality. (At the request of the State Board of Agriculture, Webster confirmed these results in 1928.)

A new Chemistry Building was occupied in 1902 and the Station Chemistry occupied the basement, much of the first floor and the attic. More space was urgently needed, so the report states. In 1902 Fields discussed the use of Bermuda grass, with results of analyses (Bulletin 55). In 1907 the chemists began intensive studies of cottonseed meal as a feed. This work was continued for nearly 50 years, with Dr. Gallup making major contributions to the subject. In the year 1908-1909 over 300 analyses were made of feeds, dairy products and probably fertilizers. Commercial companies could have analyses conducted for a fee as follows: protein and fat \$3.00; proximate analysis \$5.00; soil samples \$10.00; and complete water analysis \$10.00. These fees remained essentially unchanged until Dr. Heller retired, although complete water analyses finally cost \$5.00. At this time the Station Chemist was responsible for analyzing and checking for adulteration all samples sent in by the State Board of Agriculture. About 1910 the Station Chemistry Department was created as one of seven Departments in the Station. Apparently at about the same time the teaching department of chemistry was created with a separate head. In this year the Station reports listed for the first time, journal articles. Others had probably been published earlier. The first journal article cited dealt with the composition of kaffir corn.

In 1911-12, 515 State Board samples were analyzed for which the Board paid \$945.30. In 1911 K. C. Francis published the description of a fat-extraction apparatus, which was used in the Station for nearly 50 years and was popular throughout the country. In 1912-13 the State Board money was used to pay a chemist's salary. Note was also made that a graduate assistant was working on HCN in kaffir; such work was continued off and on until the sixties.

Dr. Dowell was appointed chemist in 1917 and led an upsurge in publishing. During this time Francis and Smith published a bulletin on the starches of grain sorghums which is still a classic on the subject Work

was done upon the fat content of feeds, comparative nutritive value of rations, HCN in pasture grasses and sorghums, holly-refuse, and the action of furfural and dextrose upon amino acids and proteins. Also a quick method was developed for determining HCN in plants (still being used) and a study made of the biological value of the proteins of peanuts soybeans and cowpeas.

During the decade of the twenties such topics were studied as broom corn silage, the nitrogen distribution in cottonseed and soybeans, soft unchanged until Dr. Heller retired, although complete water analyses finally cost \$5.00. At this time the Station Chemist was responsible for analyzing and checking for adulteration all samples sent in by the State Board of Agriculture. About 1910 the Station Chemistry Department was created as one of seven Departments in the Station. Apparently at about the same time the teaching department of chemistry was created with a separate head. In this year the Station reports listed for the first time journal articles. Others had probably been published earlier. The first journal article cited dealt with the composition of kaffir corn.

In 1911-12, 515 State Board samples were analyzed for which the Board paid \$9-5.50. In 1911, K. C. Francis published the description of a fat-extraction apparatus, which was used in the Station for nearly 50 years and was popular throughout the country. In 1912-13 the State Board money was used to pay a chemist's salary. Note was also made that a graduate assistant was working on HCN in kaffir; such work was continued off and on until the sixties.

Dr. Dowell was appointed chemist in 1917 and led an upsurge in publishing. During this time Francis and Smith published a bulletin on the starches of grain sorghums, which is still a classic on the subject. Work was done upon the fat content of feeds, comparative nutritive value of rations, HCN in pasture grasses and sorghums, holly-refuse, and the action of furfural and dextrose upon amino acids and proteins. Also a quick method was developed for determining CN in plants (still being used) and a study made of the biological value of the proteins of peanuts soybeans and cowpeas.

During the decade of the twenties such topics were studied as broom corn silage, the nitrogen distribution in cottonseed and soybeans, soft pork, food value of milk, feeding grain sorghum, the carbohydrates and proteins of pecans, and the nitrogen distribution of the proteins extracted by dilute alkali. In 1925-26, 136 feeds were analyzed and 134 samples of water. In all, a total of 2,117 determinations were made.

In 1927 Guerrant resigned and the decision was made to hire a Plant Biochemist, which resulted in the addition of Webster to the staff. This was the first time

that a person was employed for a specific field, a practice that later became quite common. Coons and Kinsman were hired to work in the field of human nutrition and Reder for general work. In 928 members of the Department taught Agricultural Organic (Webster), Home Economics Organic (Heller) and graduate and undergraduate Physiological Chemistry (Heller). Guerrant had taught qualitative organic analysis in 1926.

In 1933 the Legislature fired all of the faculty because the state had no funds, however everyone was hired the next month at a much lower salary. During the decade of the thirties salaries were cut 30% and were not restored to the earlier level until about 1939. During this time no long-term staff members were added. Dr. Gallup secured a sabbatical leave and finished his Ph.D. at Cornell. Research was conducted on mineral metabolism and trace minerals; grass forages and sorghum forages were studied in detail, as were irrigation waters and grapes. Certain vitamins also were studied and much work was done on butter and cottonseed meal. During the war years, when teaching was minimal and the college enrollment was greatly reduced, Webster was granted permission to work 125% of the time to help teach in the Armed Services program.

In 1942 the following courses (numbers shown) were being taught: Organic (245), Dairy Chemistry (394), and Agricultural Biochemistry (352) by Webster; Physiological Chemistry (313), Biochemistry I and II (512-532) by Heller; and a course in Biochemistry Lab. (572) with no teacher listed.

In 1950 Dr. MacVicar was teaching graduate Biochemistry (513). Courses in Clinical Biochemistry (422), Elementary Biochemistry (413) Biochemical Laboratory Methods (520), Vitamins and Hormones (532), Enzymes and Respiratory Mechanisms (523), and Advanced Biochemical Preparations (630) were taught or their subject matter was soon added to those courses previously taught. A course in Advanced Dairy Chemistry (493) was added to the subjects taught by Webster. At this time (1950) Dr. MacVicar was listed as the teacher of all graduate courses, but this changed as new staff members were added.

The first Ph.D. degrees in Biochemistry were issued to E. F. Reber and Henry Tigerman in 1951, the latter being a posthumous award. Previously, two Ph.D. degrees had been awarded by the Institution but they were to persons with joint majors in Animal Husbandry (nutrition). Of these James Dinning received the first Ph.D. in 1948. Several other interdisciplinary Ph.D. degrees were awarded later in the same general area.

In 1960 the faculty taught one five-hour Organic course Agricultural Biochemistry (383) and a one-hour laboratory (381), Elementary Biochemistry (413-411), Biochemistry of Domestic Animals (415), Dairy Chemistry (394), Advanced Dairy Chemistry (493), Biochemical Principles (543), Biochemistry Laboratory Methods (523) Metabolism (543), Enzymes and Respiratory Mechanisms (612), Biochemistry of Nutrition (622), Advanced Biochemical Techniques (3-6 hours) 630) and Biochemistry of Metabolic Regulators (652).

In 1970 all Dairy Chemistry courses had been dropped, Agricultural Biochemistry had been changed to a Survey of Biochemistry and the subject matter of other courses altered. Courses taught were Agricultural Organic (2345); Biochemistry of Domestic Animals (4215); Survey of Biochemistry (3653). Biochemical Laboratory (3721); Biochemistry Biochemical Principles (5753); Biochemical Laboratory Methods Metabolism (5853); Advanced Biochemical Techniques (5930); Biochemical Regulation (6733); Enzymes and Cofactors (6753); and Selected Topics in Biochemistry (6820). During the period 1930-70 staff members also handled some students in Special Problems (4990) and M.S. (5000) and later Ph.D. research (6000).

During the last twenty years (1948-1968) several staff members were added to work chiefly in special fields; Dr. Abbott (in cooperation with Agronomy) to work on Cereal Chemistry; Dr. Crane to work on insecticides; Dr. Mason in Food Chemistry; Dr. Nelson in Animal Nutrition; and Dr. Johnson (in cooperation with Animal Sciences) also to work in Animal Nutrition.

Other members of the staff selected specialties in general biochemistry. Much of the work at present may be described as "fundamental" rather than "applied" research although such a distinction was quite indefinite. The present research work is so diverse that a summary of the topics can best be secured by reference to the list of Departmental publications.