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Mc Centennial Histories - OSU
School of Ag.

O. S. U. DEPARTMENT OF AGRICULTURAL CHEMISTRY—EIGHT DECADES OF SERVICE TO OREGON

Compiled by D. E. Bullis

The Oregon Agricultural Experiment Station was established in 1888, following the passage in 1887, by Congress and signature by President Grover Cleveland of the Hatch Act which provided for the establishment of state experiment stations. Professor E. Grimm was appointed the first director and the position of station chemist was established soon afterward.

However, the beginnings of Agricultural Chemistry date back to 1883, when Professor Grimm was appointed Professor of Agriculture and Chemistry. He must have been a man of broad interests and wide training because, in addition to Agricultural Chemistry, he taught practical agriculture, fruit culture, botany, political economy and organic and inorganic chemistry. He also supervised agricultural experimental work on two acres of ground with the aid of his students. All this at a salary of \$1000 for nine months.

Although not directly related to Agricultural Chemistry, some of Professor Grimm's comments in his 1883-84 report to President B. L. Arnold are pertinent eighty years later. For example, "...ground...set apart...for experimental purposes (is)...entirely inadequate." In connection with his extensive plot tests with legumes, grasses and other forage plants, he observed, "...the cultivation of grass and forage plants...should demand our special attention." Commenting on the value of agricultural schools, he said, "...their success is due to their cooperation with the farmers through farmers' institutes, societies and cooperative field experiments."

Prof. Grimm continued as station director until about 1890 when his name disappears from the records. Between that time and 1908, the institution presidents also served as station directors. Under Grimm's directorship, P. H. Irish appears to have been the first station chemist. He also taught chemistry and physics.

W. D. Bigelow served as assistant chemist under Irish. For a short time between 1890 and 1892, Professor G. W. Shaw was station chemist as well as professor of chemistry and physics. In January 1892, Shaw apparently returned to full-time teaching and Prof. Dumont Lotz took over as station chemist. He, in turn, disappeared from the scene sometime before 1894 and Professor John Fulton, for many years head of the Chemistry Department, was acting station chemist.

to An insight into the nature of the work carried on in the Department of Agricultural Chemistry at that time may be gained from Professor Fulton's report of President Bloss covering departmental activities between January 1892 and June 1894. Their research projects included the chemistry and physics of alkali soils and methods of improving such soils, chemical evaluation of cattle feeds of the state and a chemical study of the grasses and clovers of the state. They also undertook a study of the composition of various fruits with particular reference to the elements taken from the soil on which they were grown. Samples of fruits and soils were requested from seventy-five farmers but Professor Fulton says, "The importance of these determinations was not apparent to many orchardists as only a few complied...."

However, research apparently was secondary to the pressure for analytical service on all manner of miscellaneous samples that were sent in from all over the state. They were mostly ores and waters but included such diverse materials

as milk, honey, peas, bread, syrup, and butter. The laboratory also provided analytical service for the state food commissioner who sent in everything from butter, milk, and cheese to coffee, buckwheat, and spices. The miscellaneous analytical service demands seem to have been as much of a problem then as now and Professor Fulton ends his report with this lament, "Considering the amount of miscellaneous work continually received at the laboratory...we have ample employment for nearly all the ensuing year."

In 1894, Professor Shaw again took over the station chemist position along with his teaching duties and remained in that capacity until he resigned in June 1900 to take a position at the University of California under Dr. E. W. Hilgard, who was a prominent soils man. At that time, Agricultural Chemistry was housed in the small building south of the main college building (now Benton Hall). Since those days, the building has served a multitude of purposes--college bookstore, college health service, chemistry annex, glass blowing lab., campus police headquarters and, at present, paleontology laboratory. However, it seems to have been the first chemistry building on the campus.

Professor A. L. Knisely succeeded Shaw as station chemist and professor of chemistry on July 1, 1900. John Fulton remained as his assistant and Col. Frank E. Edwards, commandant of cadets, helped in the laboratory. Both also did some teaching. Miscellaneous analytical work continued to be the principal activity of the staff although some cooperative work with other station divisions on fruits, soils and fertilizers was also undertaken. Professor Knisely also served as state chemist and, as such, did some analysis of foodstuffs for adulteration in the enforcement of the state pure food law. He also gave some extension lectures in the farmers' short courses which were an important part of the extension programs of that period.

In 1906, Charles E. Bradley, an M.S. from Pacific University at Forest Grove, joined the Agricultural Chemistry staff as assistant chemist and instructor in agricultural chemistry. He succeeded Knisely as station chemist in 1906 when the latter resigned to accept a position with the U. S. Food and Drug laboratories in Portland and, later, in their Seattle laboratories. Bradley was much more interested in research and the chemical investigations underway in the experiment station than had the earlier station chemists. It was under his regime and the following one under Dr. H. V. Tartar that the station chemistry activities began to assume the research aspect and analytical service work was relegated to a position of secondary importance in station programs.

About 1907, a state fertilizer and agricultural lime law went into effect and analysis of all commercial samples was made a responsibility of Agricultural Chemistry. Lyman Bundy was hired in 1907 as an analyst and handled this work until 1913 when he resigned and Ralph Beard took over for about three years when he, too, resigned.

H. V. Tartar was appointed research chemist and Bert Pilkington was appointed assistant chemist in the station in 1909. At first Pilkington did analytical work on soils and later devoted full time to hop and poultry investigations. He remained in the position until 1917 when he resigned to enter a farming and dairy operation.

Horticulture was assuming a prominent place in the state agricultural picture at this period and research on fungicides and insecticides quite logically became

an important part of the Agricultural Chemistry program. Tarter and Bradley carried out an extensive study of the chemical reactions involved in the preparation of lime-sulfur spray, then and still widely used as a fungicide and insecticide. He, with Bradley and Pilkington, also completed the first chemical investigation of hops made at the Oregon station. It covered composition, effect of kiln drying on resins and analysis of hops from different countries.

Another valuable contribution of this period was the cooperative work of Tartar and F. C. Reimer of the Southern Oregon branch station on the importance of sulfur fertilization for legumes. Later, they completed extensive soil analyses to point out the sulfur deficiency in many Oregon soils.

Bradley resigned in 1911 to accept an industrial position, and Tartar became station chemist, a position which he held until 1918 when he became head of the Physical-Chemistry Department of the University of Washington until his retirement a few years ago. Dr. Tartar also did some teaching and, parenthetically, was one of the very best professors this writer ever had. He published twenty bulletins and scientific papers during his nine years in the department.

R. H. Robinson came to the department as assistant chemist in 1911 to begin a research career which lasted forty years and produced seventy-five or more scientific publications and bulletins. A few of these had to do with acid soils, but the majority, by far, were in the field of his principal interest—insecticides, fungicides, spray residues, and related subjects.

In addition to his research duties, Robinson was responsible for supervision of the state fertilizer and agricultural lime laws. About 1921, the fruit and vegetable industries of the state requested a control law governing sale of insecticides and fungicides. Robinson wrote this law and assisted in its passage through the State Legislature. After its enactment he had supervision of its enforcement until 1931 when the State Department of Agriculture was established. The State Department then took over the enforcement of the fertilizer, agricultural lime, and insecticide regulations.

In the insecticide and fungicide field, Robinson did research on lime-sulfur solution, preparation and characteristics of various lead and calcium arsenates, development of casein spreaders and oil sprays.

In 1925, the future of the apple and pear industry in Oregon was threatened by an embargo on imports by Britain because of excessive arsenical residues. Robinson and Henry Hartman of the Horticultural Department worked out a chemical method and suitable equipment for removing the spray residue. The value of the development "...has been estimated in millions of dollars. A better measure is the actual fact that the greater part of the fruit crop was practically embargoed until the solution of the problem was found." (Quote from "A Half Century of Agricultural Research" by John C. Burtner) Robinson's basic method for residue removal was used throughout the United States for many years until new insecticides largely replaced the arsenicals.

Robinson retired in 1951, and he and Mrs. Robinson, who formerly was a member of the O.S.U. Home Economics staff, live in Pomona, California.

Harry G. Miller, M.S., from Wisconsin University in biochemistry came to the department in 1916. He remained in the department until 1926 when he resigned

to take a position with Procter and Gamble. He received a Ph.D. in biochemistry from Wisconsin in 1922. He did some research on the role of sulfur and nitrogen in alfalfa but most of his research was in the field of mineral metabolism, particularly sodium and potassium. Dr. Miller established the first small animal colony (white rats) on the O.S.U. (O.A.C.) campus, and used them in his nutrition studies. Of this, Dr. Miller wrote me, "I introduced the white rat as an experimental animal on the O.A.C. campus much to the wonderment and concern of Professor Brandt's staff (Dairy Husbandry) and later to the offense of Floyd Rowland's olfactory senses." (Dr. Rowland headed Chemical Engineering which was located on the fourth floor of the old chemistry building, now Education Hall, where the rat colony was also housed.) Miller retired from Procter and Gamble in 1950. He and his wife, also formerly on the O.S.U. Home Economics staff, live at Winter Park, Florida.

D. E. Bullis, an O.S.U. graduate in Chemical Engineering, was employed as assistant chemist in 1917. For several years he did analytical work on soils, feeds, fertilizers and insecticides. In the late 1920's, he began cooperative investigations with the then Food Products Department. These involved work on canning, freezing and dehydration of fruits and vegetables. A method was developed for separation of prunes into quality grades based on specific gravity. This process is covered by a public service patent. Of much greater value to the state was the process worked out for bleaching cherries for maraschino use. This basic process is still used in all cherry producing areas of the country and was developed at a time when growers in Oregon were threatened with serious losses because of lack of a fresh fruit market for their cherries. At present, about 11,000 tons annually of Oregon cherries go into the maraschino trade.

In the mid 1930's hop growers and dealers expressed a need for better means of evaluating hops. At that time, Oregon produced more than half of the hops grown in the U.S. Beginning in 1934 and continuing until his retirement in 1961, Bullis worked on development of chemical methods for hop evaluation. Some of these methods were adopted by breweries and private laboratories. Acceptance of chemical evaluation by the trade was slow but in recent years nearly all hops are tested for soft resin and oil content either at the time they are sold or by brewery laboratories to determine the proper hopping rate.

He also investigated the effects of weathering and maturity on yield and quality of peppermint oil and did some work on chemical retting of flax. During the years 1951 through 1961, Bullis also served for extended periods as acting department head. He retired to part-time duties late in 1961 after the longest continuous service of anyone in the department up to that time. During his years of service, he was author or co-author of forty-six bulletins and scientific papers.

Professor J. S. Jones succeeded Dr. Tartar as department head with part-time teaching duties in January 1919. He had been director of the Idaho experiment station for a number of years and during World War I had been on leave of absence to work at the Mussel Shoals nitrate plant. His main interests were in the fields of soils and cereal crops as well as in teaching. He was exceptionally well thought of by his students as a teacher in agricultural and dairy chemistry areas. For many years he carried on cooperative soil research with the Sherman County branch station dealing with the depletion of soil fertilizer elements, particularly nitrogen, under continuous grain cropping. During the arsenical spray residue trouble in the late 1920's he established and supervised operation of a control

laboratory in the Medford area through the critical period of the difficulty. He also investigated the composition of forage crops grown in different sections of the state and did a little work on evaluation and methods of analysis of peppermint oil.

J. C. Reeder, a recent graduate from the University of Idaho came to the department as assistant chemist about 1920. He remained only a year and then took an industrial job with an oil refinery in the Los Angeles area. Willard W. Yates followed Reeder and stayed about five years then took a job with an insecticide plant at Pittsburg, California. After a few years, he left that position because of the health hazards at the plant and went to work for the Federal Bureau of Entomology and Plant Quarantine where he remained until his retirement. His work in agricultural chemistry was as an analyst, mainly in fertilizers and insecticides. Next came Carl F. Whitaker who took Yate's place about 1926 as assistant chemist. He was with the department until 1931 when the newly established State Department of Agriculture took over supervision of fertilizer and insecticide laws and removed the related control work to Salem. Shortly after that, Whitaker was killed in an automobile accident near Corvallis.

In January 1927, J. R. Haag, a recent Ph.D. in biochemistry from the University of Minnesota, came to the department to fill the position made vacant by Dr. Miller's resignation. He was the first department member to devote full time to animal nutrition. Over the years the demand and need for animal nutrition research has expanded to the point where Dr. Haag's original one-man effort now occupies the time of four full-time staff plus several part-time employees and graduate students. He has also always taught a limited number of upper-class and graduate courses in his field. In addition to studies of calcium-phosphorus relationship in animal and poultry nutrition, Haag has also specialized in minor element disorders. In various sections of the state these may involve excess or lack of iodine, magnesium, copper, cobalt, molybdenum and manganese either singly or in combination. Through his research it has been possible to recommend suitable mineral supplements to alleviate the nutritional difficulties encountered in the affected areas of the state. These findings have been of immense value to the livestock industry of Oregon. Dr. Haag was the first researcher to discover the anti-thiamine factor in bracken fern and to relate this factor to cattle losses in instances of heavy fern consumption in pastures or dry forage. Dr. Haag served in 1955 and 1956 as a nutrition consultant to the Israeli government on one of the U.S. government sponsored foreign aid programs.

Dr. Haag retired to part-time service in July 1964 but will continue his teaching activities and minor element research in the department.

Miles B. Hatch came to the department as a graduate student after receiving his B.S. from Washington State University in 1930. In 1931, he was appointed assistant chemist and remained in the department until 1947, when he resigned to take over a fruit and flower bulb business at Puyallup, Washington, where he now lives. While with the department he worked on food preservation projects and aided Professor Jones with a study of lead and arsenic assimilation by crops and soils. For two years during World War II he served as water and sanitation chemist at the Pendleton Air Base.

Dr. Paul Weswig came to the department in September 1941 as assistant biochemist in the animal nutrition after receiving his Ph.D. from Minnesota. In the spring of 1942, he was granted a leave of absence for military duty. He

served in the Second World War as nutrition officer in Headquarters, Eighth Air Force and was discharged with the rank of major in 1946, when he returned to the department.

Dr. Weswig has carried on extensive research on vitamin A in dairy products and vitamin A metabolism and requirements in cattle. His group was among the first to use liver biopsy to determine vitamin A status in cattle. He cooperated with Agricultural Research Service, U.S.D.A., in developing and perfecting a pentosan analysis method for determining milling quality of wheat. He worked with Dr. Haag on the antithiamin factor in bracken fern which is responsible at times for serious livestock losses. More recently he has been directing the chemical phases of the cooperative research on the role of selenium in white muscle disease of calves and lambs.

His background and wide experience has been responsible for several requests by governmental agencies to participate in nutrition surveys in several foreign countries. In 1958 he was a member of a group conducting a three-month nutrition survey in Ethiopia. In 1962, he was with a similar survey in Malaya for three months and in 1964, he spent a shorter time there in a follow-up check. Also, in 1964, he was a member of a three-man committee visiting Paraguay to arrange for a nutrition survey later in the year. These surveys were sponsored by the Inter-departmental Committee on Nutrition for National Defense. Dr. Weswig was selected by the American Institute of Nutrition as one of its representatives to the International Congress of Nutrition meeting in Edinburgh, Scotland, in 1963. He serves as a Special Consultant on nutrition to the Public Health Service.

Herbert Madsen transferred to this department from Food Science Department in March 1943, then resigned in March 1944 to take a position with General Foods. His work was in the food preservation field.

In 1946, Dr. J. S. Butts took over as department head and professor of biochemistry after Professor Jones' retirement. Previous to that time, he had been with the Chemistry Department for two years, 1939-1941, and in military service as nutrition officer, Headquarters, Eighth Air Force from 1941 to 1945, and was discharged with the rank of Lieutenant Colonel. In addition to his teaching, he was particularly interested in the use of radioisotopes as tracers in agricultural chemical research. Through his efforts, the Atomic Energy Commission made the first federal grant to O.S.U. for such studies in 1951, and the grant was continuous until 1961. He also did extensive research in the field of carbohydrate and amino acid metabolism in human nutrition.

Because of his broad background in nutrition and his knowledge in the area of atomic energy, he was frequently called upon for consultation and service with various federal agencies. Between 1952 and 1961, he served on no less than six local and foreign assignments for periods of from one month to two years each.

From September 1952 until August 1954, he served in Washington, D. C., as Assistant Chief, Biology Branch, Division of Biology and Medicine of the U.S. Atomic Energy Commission. During three months late in 1954, he was in Germany with the U.S. Information Agency of the State Department in connection with an atomic energy exhibit in Berlin for promotion of peaceful uses of atomic energy. From January until June 1956, he was leader of a team studying nutritional problems in Iran and Pakistan at the request of the Iranian government. This trip was under the combined auspices of the Departments of State, Agriculture, Defense, and

Health, Education and Welfare. Later in 1956, he was one of a group headed by Assistant Secretary of Defense, Dr. Frank Berry, who conferred with the Surgeons General of several Near East and North African countries on nutrition problems. From September 1957 to October 1958, Dr. Butts was headquartered in Paris where he acted as a consultant to eleven Western European countries relative to a developmental and educational program in peaceful applications of atomic energy. This program was sponsored jointly by the Atomic Energy Commission and the Organization of European Economic Cooperation. His last foreign assignment was at New Delhi, India, from September 1960 to July 1961. Here he was a nutrition officer for the United Nations FAO food and nutrition program. His assignment was brought to an untimely end when, on April 10, 1961, he died from amoebic dysentery thus terminating many years of dedicated service not only to the state but to the nutrition problems of many less fortunate countries of the world. Nearly half of his last nine years was devoted to such activities.

Dr. Virgil Freed joined the Farm Crops staff in 1943, specializing in the chemistry of herbicides. He divided his service between Farm Crops and Agricultural Chemistry from 1946 until 1954 when he became a full-time member of our staff. He was appointed department head in 1961. He obtained his Ph.D. from the University of Oregon in 1959 in the field of Physical Biochemistry.

He has become a recognized authority on the chemistry of pesticides, particularly herbicides, and has authored many scientific papers in that field of research. They include studies on composition, absorption, adsorption, and rates of decomposition in various soil types, synergistic relationships, formulation and many others.

Edward C. Bubl became a member of the department in 1948, after receiving his Ph.D. degree in Biochemistry from Oregon State University. Originally he worked one-half time in the Food Science Department but after a few years he was transferred to full-time Agricultural Chemistry. His research was mainly in the food preservation field and in amino acid metabolism. He was one of the first researchers in the field of food preservation by ionizing radiation. He was also the first to report a radiation-resistant organism in canned food preserved in this manner. Dr. A. W. Anderson of the O.S.U. Microbiology Department later isolated and classified the organism. When a freshman in college, Dr. Bubl suffered an attack of rheumatic fever which left him with damaged heart valves. These gradually became worse and he died in the spring of 1960, some weeks after he had undergone heart surgery at the Mayo Clinic. In his passing the department lost an extremely promising young scientist.

S. C. Fang came to the department in 1948, after receiving his Ph.D. in Chemistry from Oregon State University. He did some work on the composition of filbert nuts but most of his research has been concerned with the mode of action of herbicides using radioactive tracers. Since Dr. Butts' death in 1961, Dr. Fang has been leader of the section dealing with radioisotope technics and application and he has published a number of scientific papers dealing with his research on these subjects.

LeMar F. Remmert also joined the department in 1948 as a biochemist in the field of enzymology. He received his Ph.D. from Wisconsin in 1949. He has worked some on fluoride fume injury in plants. However, most of his research has been concerned with oxidative phosphorylation enzyme systems and with the effect of certain insecticides on enzyme systems of insects. In addition to his station

research, he teaches a limited number of graduate biochemistry courses. From 1942 to 1945, Dr. R Emmert served as a nutrition officer in the Sanitary Corps of the army in the Pacific theater and was discharged with the rank of major.

Assisting Dr. R Emmert in the enzyme work is Charles R. Heisler who received his Ph.D. from the University of Chicago in 1957 and has been in our department since then.

Leon C. Terriere received his Ph.D. in Chemistry from Oregon State University in 1950 and has headed the department's section on insecticidal residues since 1951. His section works in two areas of spray residue problems, first analyses for residues and second, and of more importance, the development of analytical methods for determination of residues. Analytical methods for many of the newer insecticides do not exist and suitable procedures must be perfected before such materials can be used on food crops. Since 1955, Dr. Terriere has divided his time between this department and the Entomology Department where he directs the research on insect toxicology.

John R. Schubert worked in the department from 1951 until 1963 when he resigned to accept a position with the Public Health Service. He received his Ph.D. from Oregon State University in 1956. His work was in the field of animal nutrition and he was particularly interested in silages and methods of preservation. Probably his main contribution, and a very outstanding one, was his part in the discovery of the role of selenium in the control of white muscle disease in calves and lambs. For many years before the remedy was worked out, this disorder had been a very costly one to the livestock industry.

Robert A. Magee, a U.S.D.A. chemist, was with the department from 1949 until 1954 when he resigned to become associated with his father in bulb and cannery crop farming near Dayton. His work was concerned entirely with hop problems having to do with soil nutrients, fertilization, resin content and quality, etc.

Sam T. Likens came to the department as assistant chemist in 1951, and worked for Dr. R Emmert as an analyst in the fluorine residue project. In 1954, when Magee resigned, Likens took over the U.S.D.A. chemist position and has been associated with hop quality investigations since that time. He also has done some work with peppermint and other essential oils. He has specialized in the application of gas chromatography to his research problems.

Dr. J. P. Mehlig came to the department in 1952 to work on a part-time basis on special analytical technics in Dr. Haag's minor element program. He had previously headed the analytical chemistry section of the Chemistry Department since 1920 and was forced to retire because of the age restrictions in force in the early 1950's. Because of his knowledge and wide experience with difficult and intricate analytical procedures, his services have been invaluable to the minor elements project. He has long been a sports' enthusiast and is a veritable encyclopedia of football, basketball and baseball information.

Frank W. Adams has been in the department since 1953 in the animal nutrition section. Here he has been associated with Dr. Haag and Dr. Weswig in research on minor elements, ruminant digestion studies and other animal nutrition problems. He also has been responsible for water quality analytical work.

John Sacklin began work for Dr. Terriere in insecticidal residue analysis

after receiving his M.S. from Oregon State University in 1954. He resigned in 1957 to accept a position in the Western Washington Branch Experiment Station laboratory at Puyallup, Washington. Later, he went to the Nalley Company in Tacoma.

Dr. Ian J. Tinsley joined the department in 1957 as assistant chemist in Dr. Bubl's section. He is a graduate of Sidney University in Australia and has a Ph.D. from Oregon State University. After Dr. Bubl's death, Tinsley took over the leadership of the section. He continued the project on food preservation by ionizing radiation until the research was completed and the grant from the office of the Surgeon General was terminated. Since then, he has been studying the effects of insecticidal residues and trace elements, particularly selenium, on enzyme systems using rats as experimental animals. This research is financed by a PHS grant. In addition to his station research, Dr. Tinsley also does a limited amount of teaching for the Chemistry Department.

This account would not be complete without mention of two of our civil service people whose duties and responsibilities are commensurate with those of our academic personnel.

Marvin Montgomery, a Linfield College graduate, has been in the herbicide section since 1954. He has been delegated increasing responsibilities in that section's activities since the elevation of Dr. Freed to department head in 1961. His work has been in mode of action, effect of soil type on adsorption and absorption, uptake in and susceptibility of plants, and other herbicide problems.

Ulo Kiigemagi, a Lewis and Clark graduate, also has been a member of the department since 1954. He is in the insecticide and spray residue section under Dr. Terriere. His work has been on spray residues of the newer insecticides, particularly in the development of suitable analytical methods for determining these residues remaining on various crops to which the insecticides have been applied.

Thus ends the story of the O.S.U. Agricultural Chemistry Department as of March 1965. From a one-man department in 1887 and four men in 1917, it has grown to a staff of about 70 academic personnel, civil service workers and graduate students. It now administers on an annual budget of more than a half million dollars divided into about 40% state appropriations and 60% gifts and grants.

The department's scientific contributions and service to the state over the past three-quarters of a century, often accomplished with meager financial support and research facilities, present a challenge and offer a worthwhile goal to those who may staff the department in the next three-quarters of a century.

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