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HENRY CLAPP SHERMAN

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A Biographical Memoir by
CHARLES GLEN KING

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J. C. Sherman

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HENRY CLAPP SHERMAN was born on a farm in Ash Grove, Virginia, near Washington, D.C., and lived there during his early school years. His parents, Franklin and Caroline Clapp Alvord Sherman, were the offspring of immigrants from Britain who settled in America during the early history of New England. A former professor of mathematics at Columbia University, F. D. Sherman prepared a record of the family in "The Sherman Ancestry, 1420–1890." In Henry's immediate family there were five brothers and five sisters.

As was true of many other American leaders, Sherman's early education was in a one-room, one-teacher, gradeless school. His educational progress was rapid, however, as illustrated by his attainment of the Bachelor of Science degree from the Maryland Agricultural College (later the University of Maryland) in 1893. During the two years that followed, he continued at Maryland in graduate studies while serving as an assistant in chemistry. He received a fellowship in chemistry at Columbia University (1895–1897), where he received his Master of Science degree in 1896. In 1897, Sherman received the Doctor of Philosophy degree from Columbia—the youngest person to be awarded that degree from the university.

He continued as an assistant in analytical chemistry during 1897–1898 and, in the summer periods of 1898–1899, he served

as an assistant with Dr. W. O. Atwater in the U.S. Department of Agriculture. Sherman was particularly interested in organic analysis and the measurement of energy values. Strong friendships and mutual interests with personnel in the department continued throughout his life.

From 1899 until his retirement he served as a faculty member in the Department of Chemistry at Columbia University, successively as lecturer, instructor, adjunct professor of analytical chemistry, professor of organic analysis, professor of food chemistry, Mitchell Professor of Chemistry, and Executive Officer of the Department of Chemistry (1919–1939). The university awarded him the honorary degree of Doctor of Science in 1929.

Leaves of absence during Dr. Sherman's service at Columbia University were extended to permit him to render important services during periods of national emergency. In 1917 with the rank of major he served with the American Red Cross Mission to Russia, and from April 1, 1943, to June 30, 1944, he was Chief of the Bureau of Human Nutrition and Home Economics in the Department of Agriculture.

He often recalled with pleasure an early experience in educating the public in scientific matters when, in 1913, he served during the summer with Dr. S. N. Babcock and H. E. Alvord at the World's Columbian Exposition in Chicago.

Dr. Sherman's early association with Dr. Atwater in the Department of Agriculture stimulated an interest in the accurate analysis of foods, feeds, and related products. Thirty-six of his first thirty-eight journal papers were on this general subject during the period from 1895 to 1910. The summer periods furnished background for his early papers and eventually led him to emphasize laboratory training in quantitative organic analysis for graduate students. Dr. Arthur Thomas accepted chief responsibility in this area for the department as demands on Professor Sherman's time increased. This

Thomas did very effectively in parallel with his own teaching and intensive research in colloid chemistry.

Dr. Sherman had a similar experience with another of his research projects. Beginning in 1910, when Edward C. Kendall was his graduate student, Dr. Sherman's interest in the chemistry of enzymes, particularly in relation to the starch-splitting amylases from plant and animal sources, developed rapidly. Twenty papers appeared within the first seven years of Sherman's research in this field. Then it was gradually accepted as a major field of emphasis by his former student and continuing faculty associate, Dr. Mary L. Caldwell. Their evidence that the enzyme was essentially a pure protein was one of the important contributions (in parallel with the evidence of James B. Sumner, John H. Northrop and others) that challenged the persistent views of Richard Willstätter and others in Europe that it was possible to prepare enzymes free from protein. Sherman pointed out two basic errors in Willstätter's interpretation: He and his associates had permitted hydrolysis of protein during long periods of dialysis, and then used tests for enzyme activity that were more sensitive than the tests used for protein.

As the evidence became increasingly clear that deficiencies of protein, iron, calcium and vitamins were major health problems, Sherman began to conduct short-term experiments on balances in relation to food intake. Then, he gradually turned to long-term quantitative studies of nutrition in relation to health. He also did much to encourage greater public and professional interest in these aspects of nutrition research. Two major types of life-span studies on food intake in relation to health in albino rats were emphasized: first, a comparison of experimental diets based on definite quantities of common foods through several generations and, second, observation of the improvement that resulted from adding known quantities of specific nutrients thought to be marginally deficient. One group of rats was fed a diet (No. 16) based *solely* on one-sixth part by

weight of whole milk powder plus five-sixths parts by weight of ground whole wheat, 1.3 percent of table salt and distilled water. This diet supported fairly good growth, prevented any specific signs of malnutrition, and permitted reproduction through more than 40 generations. But the record of this group of rats for early maturity, longevity and surviving offspring clearly was not as good as the record of a group fed diet No. 13, which contained one-third whole milk powder and two-thirds whole wheat, plus salt and distilled water. Addition of calcium or vitamin A to diet No. 16 resulted in distinct improvement. But addition of good quality protein, which accelerated early growth, caused less favorable records—unless additional calcium was furnished to compensate for the early rapid growth and increased bone development. The meticulous care of experimental animals by H. Louise Campbell was of great assistance in these long-term studies that could not be readily conducted by graduate students.

Another example of improving diets of marginal value was shown in relation to vitamin A. In life-span tests about four times as much of the vitamin, supplied as fish liver oil, was required for best performance, compared to the quantity that prevented physical signs of vitamin A deficiency.

As there was no evidence of the exact nature of any of the vitamins at that time, and hence no certainty of chemical methods of measurement, Dr. Sherman recognized the need to develop reliable methods of biological assay, which would reflect a quantitative measure of the conjectured nutrient associated with such specific deficiency diseases as scurvy, beriberi, rickets, xerophthalmia and pellagra. For example, "one unit" of vitamin C could represent one-tenth of the quantity of vitamin C required per day to prevent scurvy in a standard guinea pig. Sherman's assay methods for vitamin A, vitamin B_1, vitamin B_2 (riboflavin), and vitamin C were widely adopted and made an important contribution to advancing nutrition on a

quantitative basis. The thoroughness with which he sought to identify the approximate range of optimum intake of individual nutrients or specific types of food mixtures was remarkable—particularly in terms of numbers of animals used, length of time involved, number of surviving offspring, growth rate, longevity, tissue storage, and statistical evaluation of data as a basis for conclusions. His human balance experiments with calcium, phosphorus, iron and protein were regarded for many years as the best guides to health requirements for these minerals.

When queried or chided by his friends for devoting so much of his time, energy, and resources to biological research, his enthusiastic reply was, "These animals are my burettes and balances. They give quantitative answers in chemical terms to many of man's greatest problems!" Sherman was not interested in spectacular discoveries as such, but he was wholeheartedly devoted to research that he was confident would result in substantial advances in human health, greater efficiency in agriculture, improvements in food technology, or, in time, would accelerate chemical understanding of life processes.

Sherman was meticulous in his insistence on careful records from his graduate students in research (records were required in duplicate form, one for his files and one for the student), in the citation of others' publications, and in the exact wording of each manuscript. As reported by his associate, Dr. E. J. Quinn, when one of the students expressed a complaint at the requirement of so many successive drafts for journal papers, Dr. Sherman replied quietly, but with unmistakable firmness, "As many drafts may be required as there are paragraphs in the finished manuscript."

Sherman's immediate interest in possible applications of research to improvements in the full gamut of food practices, from agriculture to the consumer, was illustrated in 1927 when he was shown the assay data confirming a high concentration

of vitamin C in green peppers. Knowing that this author had worked with peppers during earlier years on a farm, he asked a whole series of questions concerning how widely peppers could be grown in different areas, how well they met requirements for marketing, and the variety of ways they might be utilized in food practices. And, when he learned that samples of powdered milk from newly developed spray driers showed a distinctly higher content of vitamin C than was contained in the product from conventional drum driers, he smiled and said quickly, "I think the Borden Company will be glad to know that!"

Professor Sherman's keen interest in the relationship of food practices to health was evident in nearly all of his lectures and writing. Through many years, beginning in 1920, he joined with Professor C. E. A. Winslow and others in Reports on Nutrition Problems or reports on specific topics for the American Public Health Association and its journal. His textbooks on nutrition soon became the most widely used in their respective spheres, and his books of a more general nature or on specific topics had wide acceptance. Sherman's first text, *Methods of Organic Analysis* (1905) was published in a second edition in 1912; the second text, *Chemistry of Food and Nutrition* (1911; 7th ed., 1946) was the most widely used of all. The monograph entitled *The Vitamins,* with S. L. Smith as coauthor, was a notable contribution sponsored by the American Chemical Society through two editions (1922 and 1931). Both as a public service and as a tribute to his outstanding contributions in nutrition education and research, Sherman's associates, with assistance from the Nutrition Foundation, prepared for the Macmillan Company a single volume, *Selected Works of Henry Clapp Sherman,* published in 1948.

His own evaluation of the science of nutrition is well expressed in the introduction to the book: "There is already a world-wide awakening of interest in the potentialities of the

knowledge already gained, and of desire in almost every nation that the benefits of this newer knowledge of nutrition shall be brought within reach of all its people through more adequate and better-balanced food supplies. All over the earth there are now modern-minded men of affairs who, without necessarily having a scientific understanding of nutrition, have nevertheless grasped the fact of its significance for higher health and longer, more efficient life; and are working, both through education and governmental action to bring these benefits to their people. In the non-technical language of Lord Astor they see the importance to their people having, 'not only enough food, but further, enough of the right kinds of food.' Thinking nationally, each wants the higher efficiency of a better-nourished body of fellow-citizens. Thinking internationally, all are coming to want a more equitable distribution of the world's food among the world's people. Our increasingly scientific concept of better use of food and of resources for food production is keyed to the growing realization that all people live in one world."

The faculty at Teacher's College of Columbia University contributed extensively to Dr. Sherman's accomplishments in nutrition education and in the joint sponsoring of students for graduate degrees and research. Mary Schwartz Rose, Grace MacLeod, Clara Mae Taylor, and Orrea Pye were recognized nationally and internationally as among the most energetic and effective leaders in nutrition education. Professor Sherman served as chairman of a special committee in the Graduate School with responsibility for establishing requirements for Ph.D. students in nutrition and for guiding them in the selection of their course work. In chemistry and in other basic sciences, the students were required to meet the same standards in designated courses and examinations as other students in the respective disciplines. The large seminar originally chaired by Dr. Rose, but later by Dr. Sherman, in the chemistry department was interdepartmental and included faculty members and

selected graduate students in other departments and in Teachers College.

In addition to postdoctoral scientists who participated in research with Professor Sherman, a large number studied with him as their major adviser for the Ph.D. degree. E. C. Kendall and A. O. Gettler were among his first students. Among others were A. W. Thomas, V. K. LaMer, and M. L. Caldwell, who remained on the department staff, and P. L. Day, J. H. Axtmayer, A. Spohn, R. T. Conner, M. Adams, M. D. Schlesinger, H. K. Stiebeling, E. L. Batchelder, E. N. Todhunter, M. L. Fincke, E. W. Toeper, F. L. MacLeod, and E. Woods.

The intensity and persistence with which Dr. Sherman normally worked made one hesitant to interrupt or ask for an appointment unless a serious issue were at stake. His sincere personal interest in his students and faculty associates and his remarkable sense of courtesy were so clear, however, that demands on his time were always heavy. Hence, it was delightful, and one of his great gifts, to see how quickly and naturally he would relax at luncheon, dinner, or other break periods and show a continuing sense of subtle humor that made his friendship doubly rewarding.

Sherman was by nature relatively quiet and shy, with a steadfast sense of courtesy, honesty, discipline, and kindliness. Both his home life and his spontaneous relationships with others were characterized by these qualities. As a teacher, Sherman was a continuing inspiration to his students.

His most famous student, Nobel Laureate Edward C. Kendall expressed his regard for Professor Sherman in terms that others would gladly endorse: "His scientific papers do not reflect his genial capacity for friendship, his deep understanding of human nature, his lack of malice and intrigue, his sense of humor, his modesty and in short, his kindly spirit which endeared him to his students and associates." And P. L. Day, an outstanding student, many years later wrote, "Although quick

of wit he did not indulge in breezy repartee; neither did he ever raise his voice in argument or anger."

Beyond his direct services to Columbia University, Dr. Sherman accepted numerous professional appointments, including Research Associate with the Carnegie Institution, 1912–1929, 1933–1939; member of the Committee on Food and Nutrition, National Research Council, 1920–1928, 1940–1943, and chairman of the Committee on Human Nutrition, chairman of the Committee on Nutrition Problems, American Public Health Association, 1919–1933; Scientific Advisory Committee of the Nutrition Foundation, 1942–1952; President of the American Institute of Nutrition, 1931–1933; collaborator, U.S. Nutrition Laboratory 1940–1942; and Chief, U.S. Bureau of Human Nutrition, 1943–1944.

Special honors received by Dr. Sherman included medalist, American Chemical Society, 1934; Franklin Medal, Franklin Institute, 1946; Chandler Medal, Columbia University, 1949; Borden Award, American Institute of Nutrition, 1950; Vice-President, American Chemical Society, 1907–1908; President, American Society of Biological Chemists, 1926; member, National Academy of Sciences, 1933; honorary member, the Harvey Society.

There were four children in the Sherman family, Phoebe (deceased, 1929), Henry Alvord, William Bowen (deceased, 1971), and Caroline Clapp (Mrs. Oscar E. Lanford, Jr.). Henry, William, and Caroline all had outstanding careers, respectively, in chemical engineering, medicine, and biochemistry.

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KEY TO ABBREVIATIONS

Am. Food J. = The American Food Journal
Am. J. Physiol. = American Journal of Physiology
Am. J. Public Health = American Journal of Public Health
Am. Med. = American Medicine
Am. Public Health Assoc. Yearb. = American Public Health Association Yearbook
Ann. Rev. Biochem. = Annual Review of Biochemistry
Ann. Surv. Am. Chem. = Annual Survey of American Chemistry
Bull. N.Y. Acad. Med. = Bulletin of the New York Academy of Medicine
Carnegie Inst. Wash. Yearb. = Carnegie Institution of Washington Yearbook
Child Health Bull. = Child Health Bulletin
Columbia Univ. Q. = Columbia University Quarterly
J. Am. Chem. Soc. = Journal of the American Chemical Society
J. Am. Diet. Assoc. = Journal of the American Dietetic Association
J. Am. Med. Assoc. = Journal of the American Medical Association
J. Biol. Chem. = Journal of Biological Chemistry
J. Chem. Educ. = Journal of Chemical Education
J. Franklin Inst. = Journal of the Franklin Institute
J. Home Econ. = Journal of Home Economics
J. Ind. Eng. Chem. = Journal of Industrial and Engineering Chemistry
J. Nutr. = Journal of Nutrition
Proc. Natl. Acad. Sci. = Proceedings of the National Academy of Sciences
Proc. Soc. Exp. Biol. Med. = Proceedings of the Society for Experimental Biology and Medicine
Sch. Mines Q. = School of Mines Quarterly
Sci. Mon. = Science Monthly
U.S. Dep. Agric. Bull. = U.S. Department of Agriculture Bulletin

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