Russell Henry Chittenden was a citizen of New Haven; he was born in New Haven in 1856, he was educated at Yale University, he was a distinguished member of the teaching, research, and administrative staff of Yale University, and after his retirement from active service in 1922 he continued his residence in New Haven until his death on December 26, 1943. With the exception of a brief period of study in Germany, his scientific activities were carried out in the city in which he was born.

Chittenden was graduated from the Sheffield Scientific School of Yale University in 1875 at the age of nineteen. During his senior year, the first definitive laboratory of physiological chemistry for the instruction of students was established and the young chemist was placed in charge. As he himself has stated: "the movement was an experiment and the authorities obviously felt it unwise to risk much in a venture that might prove unsuccessful." Thus modestly, in a single room capable of accommodating eight students, but reasonably well equipped, began the new course which was designed primarily for the instruction of students who were planning to study medicine. It is significant that this pioneer course originated not in a medical school, but in a university department of chemistry. The young instructor, trained in chemistry, naturally emphasized the more purely chemical aspects of physiology. Thus Chittenden entered a new field of teaching and research which he was to make peculiarly his own. He continued this instruction after graduation and, in 1877, was appointed instructor.

The undergraduate thesis of Chittenden was concerned with "Glycogen and glycocoll in the muscular tissue of Pecten irradians" and was notable as a contribution to the chemistry of invertebrate muscle. This research, published originally in the American Journal of Science and Arts and subsequently in Germany in Liebig's Annalen der Chemie, served well as an introduction for the young Chittenden to Willy Kühne, Professor of Physiology at Heidelberg. When Chittenden in the fall of 1878 went to Germany for a year of study, he applied to Kühne for a place in his laboratory. Kühne displayed no particular interest until, glancing at the visiting card presented, he inquired, "Are you the Chittenden who published in Liebig's Annalen a year or two ago an article on glycogen and glycocoll?"

As Chittenden himself has written, "The atmosphere was completely changed and my spirits rose accordingly, reaching a still higher level when
Kühne remarked that he would find a place for me in the laboratory at once." Thus began the relationship to Kühne as student, assistant, coworker, and friend, which continued until the former's death more than twenty years later. On Chittenden's return to Yale, he undertook with his students a research project on the primary cleavage products of proteins by digestive enzymes in close cooperation with the Heidelberg group, a project which continued for eight years. The interest of the Yale group was thus focused early on proteins, on proteolytic enzymes, and on the physiology of the gastrointestinal tract, an interest which continued for many years. Chittenden received the degree of Doctor of Philosophy in 1880, and in 1882 was appointed Professor of Physiological Chemistry in the Sheffield Scientific School, a position which he continued to hold until he became an emeritus professor in 1922.

The new laboratory soon attracted students, and by 1885 graduate work in physiological chemistry was well under way, a total of eleven papers by Chittenden and his students appearing during the college year of 1884–85. From the modest beginning of 1874, the laboratory of physiological chemistry of the Sheffield Scientific School developed, a laboratory which, under the leadership of Chittenden and his pupil and colleague, Lafayette B. Mendel, pioneered in the training of teachers and investigators in physiological chemistry and chemical physiology.

Chittenden's demonstrated ability in organization and administration resulted in his selection as administrative head (director) of the Sheffield Scientific School in 1898, a position which he occupied until his retirement in 1922. Although the increased burden of administrative duties made it necessary for him to relinquish much of his active teaching and research, his interest was still centered in physiological chemistry, and he continued to meet one class in the physiology of nutrition until 1916.

Chittenden's organization of the work in physiological chemistry was not confined to the Yale group. In 1898 he was requested by Columbia University to organize a Department of Physiological Chemistry at its College of Physicians and Surgeons. For five years, he devoted one day a week to this work, and, at the end of this period, the department was placed in charge of his pupil, William J. Gies.

During the period in which the organization of the Yale laboratory was his chief concern, the horizons of the biological sciences related to medicine were being extended. The American Physiological Society was organized on December 30, 1887; present at the organization meeting, and a charter member, was Chittenden, who in 1890 was elected a member of the Council, a position in which he served for fifteen consecutive years. In 1896, he was elected president of the Society and was reelected in successive years until 1904, a period of nine terms, the longest service in the history of the
RUSSELL HENRY CHITTENDEN

Society. In the meantime, biological chemistry had come of age as a separate discipline, so that it seemed wise to organize a national biochemical society. At the organization meeting held in New York on December 26, 1906, Chittenden was among those present and as the leading biochemist of the country was selected as the first president of the American Society of Biological Chemists. When in 1933 developments in the field of nutrition were such that a new organized group, the American Institute of Nutrition, was warranted, Chittenden was again included in the list of charter members.

His interest in the various professional societies continued long after his retirement from active university life. His last participation in the meetings of the Federation of American Societies for Experimental Biology was in 1938 at Baltimore, when the semi-centennial of the American Physiological Society was celebrated. Here he was an honored guest and spoke briefly at the banquet of the American Institute of Nutrition and was one of four of the charter members of the Physiological Society who were assembled for the semi-centennial celebration.

Chittenden was active in the editorial work of various journals. With Bowditch of Boston and Howell of Baltimore, he represented physiology in the group of editors of the Journal of Experimental Medicine (1896); he was one of the seven members of the Physiological Society who comprised the first editorial committee of the American Journal of Physiology (1898).

In the critical period at the beginning of the present century, when the enforcement of the new food and drug legislation was beset with difficulties, the services of Chittenden were placed at the disposal of the United States Department of Agriculture. He was a member of the Referee Board of Consulting Scientific Experts (commonly known as the Remsen Board) and not only served as a consultant but also in his own laboratory personally supervised studies on the influence of various food preservatives on the nutrition and health of man. His experiments with sodium benzoate (published as a part of the report of the Referee Board in 1909) serve as a model of carefully planned, well conducted, and conservatively interpreted research in this field.

Of the researches conducted under Chittenden's direction, his experiments on the protein element in human nutrition are of particular interest. They were carried out in a period in which the dietary standards of Carl Voit were accepted without serious question. These standard diets included relatively large amounts of protein (118 gm. daily). In extensive experiments on subjects which included himself and his colleagues, Mendel and Underhill, typical Yale students, and a group of enlisted men assigned to New Haven by the Surgeon General of the United
States Army, Chittenden was able to prove that good health, physical vigor, and nitrogen balance could be maintained on levels of protein intake far below those of the Voit standard diet. These results, although highly controversial at the time of their publication, are now accepted with little question.

It is not the purpose of this memorial to present a detailed account of the many honors conferred in recognition of the achievements of this pioneer worker in biological chemistry. He had seen the development of physiological chemistry and nutrition in this country for more than sixty years. His book, "The development of physiological chemistry in the United States" (1930), presents these developments as he saw them. An unpublished manuscript, the work of his later years, awaits publication. It is concerned with the history of the American Society of Biological Chemists, in whose organization he participated and of which he was the first president.

Howard B. Lewis
RUSSELL HENRY CHITTENDEN: (1856–1943)
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