A sudden fluctuation in the weight of the hog might upset all his calculations and the final answer be obtained only in time to hand in his thesis at the twelfth hour. After graduation there remains, of course, the investigation of the size, shape, consistency, etc., of the bread used in ham sandwich-making, whether rolls are permissible or not, the origin and history of the use of mustard, until at last, after years of labor, the most complete, the most exhaustive and the most learned monograph on the ham sandwich is given to the world, and the author is hailed as one of its leading scientists. He may then devote himself to the monographing of other sandwiches, finally becoming the world's authority on this group, having specimens sent for identification from every railroad station in every sandwich island and continent of the civilized world.

Absurd as the foregoing may seem, you all know that actual examples of so-called research work might be cited which would be not a whit more sensible. A serious examination of the countless papers published in any one of the sciences will reveal an appalling number of trivial, inconclusive, unscientific effusions, at the most mere petty records of hypotheses and haphazard observations, which far from being contributions to knowledge, are but a means of disclosing the ignorance of their authors of the first principles of science.

That such work should be bolstered up by the claim that possibly it might be turned to some practical application, is calculated to bring all research, good or bad, into disrepute. I do not believe that any member of a board of trustees or a prospective philanthropist is fooled by the attempt to justify herbaria or libraries or laboratories solely on the grounds of definite, practical usefulness to mankind in general. If botanical research is not of enough importance to sustain itself regardless of any incidental benefit that may arise through it, the greater portion of it would better be dispensed with in order that the time and effort and money now wasted be turned to something capable of standing on its merits.

It is to be hoped that either through the perpetuation of the Research Council, or better, through some committee representing all botanical interests, there may be an organized attempt to raise the general standard of research work in botany at least. But why stop here? Is it not time that botanists recognize in a tangible way their obligation to the public at large, and that we see to it that our profession takes a worthy part in the world work of the future? Perhaps it has in the past. If so, it behooves us more than ever to stand firmly for our rights and the recognition due us. In spite of the shudder that may pass over some of you present I venture to suggest that a committee of the Botanical Society of America on publicity might not be out of place. Other sciences which apparently need it less, have not hesitated to adopt such modern methods. There might also be added a committee on botanical raw materials, with sub-committees on economic or applied phases of certain special topics, or, if it seemed best, a general development committee which would deal with botanical ideals and ideas in a way calculated to crystallize the more essential activities of the science and make more tangible the benefits and achievements resulting from a fundamental knowledge of plants. Surely the need for something of this kind is quite as great as the object of committees already in existence. Perhaps too much attention can not be paid to the details of the multitudinous ramifications which sprang from the parent trunk, but we cannot afford, either for our individual or professional good, to neglect the subject as a whole. No time could be more propitious for accenting the place which botany holds. It may have been a "chemical war" which the world has suffered. I for one am perfectly willing to let it go at that. But should we not do something definite towards making it a botanical peace upon which we are about to enter?

George T. Moore
Missouri Botanical Garden

SAMUEL WENDELL WILLISTON[1]

Samuel Wendell Williston, our distinguished senior colleague in vertebrate paleon-

[1] Based on the author's article in *The Journal of Geology*, November–December, 1918.

tology, passed away August 30, 1918, honored and beloved by all who knew him. Our admiration for his character and achievements is enhanced through a perusal of his personal recollections[2] of his career, which reveal long struggles towards scientific attainment, lofty ideals of exploration and research, and an unfaltering determination.

Like all men of science who have risen to distinction, Williston was self-made, the impulses all coming from within; yet he was instinctively alert to seize every chance to learn and to expand his horizon. We can not imagine a life story more helpful than his to the youth predisposed to science who has both to discover his own talent and to explore every avenue of opportunity which presents itself.

Williston was born in Roxbury, now a part of Boston, July 10, 1852. He writes:

> The Williston family has been traced back to about 1650 in Massachusetts; they were about the usual run of common people, no one famous or even noted, whether for good or evil. . . . Some of them served in the War of the Revolution, and many were fishermen.

His father was born in Maine, and he remarks of this branch of the family:

> They knew little of schools. My father, if he ever went to school, did not take kindly to study, for he never learned to read or write. . . . It was a great pity, too, for my father was a man of far more than ordinary ability as a mechanic—he was noted always for his skill. . . . Of all his children I resemble him the most, both physically and mentally.

His mother was from England, having come with her parents to New Jersey about 1812. She had a fair common-school education, and the effects of her early English training and her accent remained through life.

The intellectual and social environment of Roxbury probably never would have produced a geologist or a paleontologist, and while the next step in Williston's life was hard, yet it was propitious, as the events proved:

> In the spring of 1857 my parents decided to emigrate to Kansas. A colony had left the year before for Manhattan, and the letters that came back had infected many with the desire to go West. . . . The abolitionists were urging eastern people to colonize the territory in order to help John Brown preserve it to the "Free States." . . . The trip was long and tedious, by rail to St. Louis, then a small place, and thence by steamboat up the Missouri River to Leavenworth. There was no Kansas City then. We reached Leavenworth about the twentieth of May. Here we remained a few days in a very small hotel, while my father bought a yoke of oxen and a wagon and such provisions and household things as were indispensable, and we started on the slow and tedious drive of 115 miles to Manhattan through a country but very sparsely settled. For the most part we children rode in the covered wagon while my father and cousin walked and drove the oxen.

The first building erected in the new town was the stone school-house, to which books were supplied by the Emigrant Aid Society. At the age of seven young Williston made his first collection of fossil shells, from deposits since determined as belonging to the Lower Permian. Following school, he entered the State Agricultural College in 1866. At the age of fifteen he came under the rare influence of Professor Benjamin F. Mudge, who loaned him a copy of Lyell's "Antiquity of Man." Mudge conducted all the courses in natural history, and through his splendid character and example exerted a great influence on young Williston. It was quite by accident, however, that seven years later Williston was included in Professor Mudge's party to northwestern Kansas (Smoky Hill Valley Cretaceous) where Professor Mudge, already famous through his discovery in 1872 of a specimen of *Ichthyornis*, was collecting.

Vertebrate paleontology had become his first love, but he had leanings towards human anatomy and medicine and entomology, first as an avocation and then as a vocation. He was afforded no independent opportunities for paleontological research and publication by Professor Marsh, by whom he was invited to come to New Haven in February, 1876. In the summer seasons of 1876 and 1877 he col-

[2] See "Recollections," an unpublished autobiography, written May, 1916, copyrighted by Mrs. S. W. Williston.

lected with Professor Mudge in the Cretaceous chalk of Kansas. In 1877 he was sent by Professor Marsh to the Morrison, Canyon City and Como quarries to cooperate with Professors Lakes and Mudge and Mr. Reed in taking out the types of *Atlantosaurus, Diplodocus* and other sauropods. In Professor Marsh's laboratory Williston worked on the dinosaurs. In the field in 1878 he helped to collect the "Jurassic Mammals" and some of the smaller dinosaurs. For nine years (1876–85) he worked in Professor Marsh's laboratory, where he became closely associated with Marsh's other assistants, especially Harger and Baur.

While acting as assistant in paleontology he studied medicine at Yale, received the degree of M.D. in 1880, continued his post-graduate studies, and received the degree of Ph.D. at Yale in 1885. He then became demonstrator of anatomy (1885–86) and professor of anatomy (1886–90) at Yale and practised medicine in New Haven, where he was health officer in 1888–90. In 1886 he published some criticisms of Koken's work on *Ornithocheirus hilsensis* which give us some hint of his abiding interest in Kansas fossil reptiles, an interest which was soon to bring great results.

The turning-point in his scientific career, from anatomy and medicine to paleontology, came at the age of thirty-eight, when he returned to the University of Kansas as professor of geology. Kansas was the scene of his first inspiration in paleontology, and here his fossil studies and vigorous health marked the happiest period of his life. He taught both vertebrate and invertebrate paleontology, anatomy, and medicine, and several of his students have achieved distinction in these fields.[3] With respect to the breadth of his studies and of his influence at this time, his life was comparable only to that of Joseph Leidy, who, it will be recalled, was at once an anatomist, a physician, a paleontologist and a microscopist of distinction. He soon began to publish studies on the Cretaceous reptiles of Kansas. Henceforth Kansas plesiosaurs and turtles, mosasaurs and pterodactyls, were the subjects of a long list of papers mostly in the *Kansas University Quarterly,* from 1890 to 1899, with occasional articles on Kansas fossil mammals (*Platygonus, Aceratherium, Teleoceras fossiger*). Meanwhile he made many explorations of the Cretaceous of Kansas for fossil reptiles. At Kansas University Williston also kept up his two avocations of anatomy and dipterology; he served as professor of anatomy and dean of the medical school. He also continued to publish many papers on recent diptera. He accomplished a great work on this group and became the leading dipterologist of the United States. His studies culminated in the preparation of his "Manual of North American Diptera," a book which is indispensable to a beginner in dipterology and a very great convenience to advanced workers.

[3] Among these paleontologic students, who have since become known for their researches, were: E. C. Case, C. E. McClung, Roy L. Moodie, Herman Douthitt, Alban Stewart, Elmer S. Riggs, Barnum Brown, M. G. Mehl, E. B. Branson and E. H. Sellards.

Paleontologic Work in Kansas[4]

Williston's paleontologic contributions on the Cretaceous fauna of Kansas began in 1879 with a short paper entitled "Are Birds Derived from Dinosaurs," and included fifty-three communications, chiefly to the Kansas Academy of Science, the *Kansas University Quarterly,* and the University Geological Survey of Kansas; also three volumes on the "Cretaceous Fishes" in cooperation with Alban Stewart; and "Paleontology (Upper Cretaceous)," Part I., Volume IV., of the University Geological Survey, which was chiefly prepared by Williston with the assistance of his students Adams, Case and McClung, and is a thorough review of the geology and marine fauna of the Cretaceous seas, containing the first clear distinctions and restorations of the great Kansas mosasaurs, *Clidastes,*

[4] These notes on Williston's work on fossil reptiles and amphibians have been prepared in collaboration with Professor W. K. Gregory of the American Museum of Natural History.

Platecarpus and *Tylosaurus*. This work became the standard for all subsequent researches of Osborn, Wieland and others on the Cretaceous fauna. It contains some admirable restorations of mosasaurs and other fossils which may be compared with those of Dollo from the Maestrichtian of Belgium. The second part, Volume VI. of the University Geological Survey, covering the Carboniferous and Cretaceous, published in 1900, included the Cretaceous fishes alluded to above, and the Carboniferous invertebrates by Joshua W. Beede.

Williston concluded his studies of the Cretaceous fauna during the early years of his professorship in Chicago, beginning in 1902. Thus his work on the Kansas Cretaceous fauna, following the very disjointed contributions of Leidy, Marsh and Cope based on inferior material, marks the turning-point in this field to the new order of description and generalization based upon complete material, including even the skin impressions of several great mosasaurs. In his observations on the mosasaurs, plesiosaurs, pterodactyles and marine turtles, and the birds with teeth, *Odontornithes*, he placed the osteology of these several animals on a much more secure basis, adding a number of new generic types, such as a short-necked plesiosaur, *Dolichorhynchops osborni*.

His first contribution to the phylogeny and classification of the Reptilia as a whole appeared in 1905 and was followed by his important discussion of this subject entitled "The Phylogeny and Classification of Reptiles," *Journal of Geology*, August, 1917. In this article, which expresses his mature opinions, he departed from his previous conservative attitude towards classification and proposed to add two subclasses of reptiles, the Anapsida and the Parapsida, to the subclasses previously proposed by Osborn, namely, the Synapsida and the Diapsida, making a fourfold grand division of the Reptilia. Doubtless it was Williston's intention to fortify this system of classification in his forthcoming general work on the Reptilia.

WORK ON PRIMITIVE AMPHIBIANS AND REPTILES[5]

In 1902, at the age of fifty, Williston was called to the University of Chicago as head of the new department of vertebrate paleontology, a chair which he occupied with great distinction and with continued influence for the remaining sixteen years of his life. He now began to concentrate his attention more exclusively on vertebrate paleontology. During the first six years he continued his studies and publications on the Cretaceous reptiles; then he began to turn towards the study of far more difficult and obscure problems, namely, the relatively primitive amphibian and reptilian life of the Permian, where in several groups he marked the beginnings of the higher forms which he had previously studied, as well as the adaptive radiation of the lower forms to a great variety of habits and habitats.

In 1911 he published from the University of Chicago Press his volume, "American Permian Vertebrates," which comprises a series of monographic studies on some of the genera already noted. This work contains many new and original plates. His principal publication in 1914 was the book on "Water Reptiles of the Past and Present," in which his life-work on these animals was admirably combined with the results obtained by other workers. Williston had shown a bent for the harmonious study of form and function, of structure and habit, of environment and adaptation, which he applied with skill and originality to the interpretation of the highly diversified forms of aquatic life. He followed Eberhard Fraas of Stuttgart in making a special study of aquatic adaptations in the vertebrates; consequently his book on the water reptiles constitutes one of the most important contributions which we have on this subject. In 1917 he began a general work on the "Reptiles of the World, Recent and Fossil," upon which he was actively engaged up to his last illness; also the publication of his papers on *Edaphosaurus*, on the atlas-axis complex of reptiles, and, equally important, his brief

[5] See footnote, p. 276.

paper on the "Phylogeny and Classification of Reptiles," previously mentioned. During the last two years of his life he was also preparing a paper on new Permian reptiles. It is a matter of the deepest regret to all of Williston's colleagues in paleontology that he did not live to complete his great comparative work on the Reptilia, which would have summed up all his researches and observations and the facts stored in his mind which have never found their way into print.

A few of the more general features of Williston's life-work and character are as follows: He strove arduously through forty years of investigation to discover new material in the field and to widen our basis of facts in several distinct lines of investigation; he preferred to discover new facts rather than to reinterpret older ones or to adjust the interrelations of facts; in general, his material was notably of his own finding. Nevertheless, especially in his late years, he labored very successfully to classify and synthetize his material, and with it that which had been treated by other workers. Here his genial personal character and admirable relations with his colleagues shone forth; he was singularly appreciative of the work of other men and ready to adopt whatever he believed to be solid and enduring in previous attempts at classification. Thus Williston's work stands in contrast with that of Cope and Marsh, whose personal differences of opinion led to the setting up of two entirely distinct systems of classification as well as of nomenclature, irrespective both of priority and of merit. Williston's keen, broad knowledge of human anatomy, of the muscles as well as of the bones, doubtless aided his penetrating insight into the habits of the extinct animals, and while generally conservative and cautious, his phylogenetic studies and suggestions were of high value. His views on taxonomic standards[6] and on college and high-school education[7] were, like his views on paleontologic problems, characteristically sober, moderate and well considered, lighted up in their expression with his genial, half-humorous manner. He was ready to confess and appraise defects or faults on his own side, but quick to resent exaggerated accusations and criticisms from the other side.

His friends and colleagues met him last at the Pittsburgh meeting of the Paleontological Society of America, December 30, 1917, and enjoyed a few of his short and characteristically enthusiastic communications and discussions. With Dr. Holland, myself and many other warm friends he stayed the old year out and saw the new year in at the society smoker. He returned home quite suddenly, and this was the last occasion on which we were privileged to enjoy his genial presence, his humorous narratives, and his inspiring influence in paleontology.

Henry Fairfield Osborn
The American Museum of Natural History,
February 21, 1919

[6] "What is a Species," *Amer. Nat.*, XLII., 184–94.

[7] "Has the American College Failed to Fulfill Its Function?" *Proc. Nat. Educ. Assn.* (1909), p. 526.

SCIENTIFIC EVENTS

THE BRITISH MINISTRY OF HEALTH BILL

The text of the Ministry of Health Bill, presented to the House of Commons on February 17, has since been published. According to *Nature* the bill differs little from the measure originally presented to the last Parliament. That it does differ to some extent, however, particularly in bearing signs of having been worked at and polished, is worthy of mention. The new bill carries the stamp of finality, and suggests that most of the State Departments performing health functions—the Local Government Board, the Board of Education, and the Insurance Commissioners especially—have arrived at arrangements more or less agreeable to all parties. The position as between the two first-named, for example, is shown to be fairly easy. Even as regards the place to be taken by the Insurance Commissioners, there is less reason for dissatisfaction, and concessions no doubt have been made by the various bodies and individuals concerned. Speaking generally, the measure