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CHARLES DOOLITTLE WALCOTT

1850—1927

A Biographical Memoir by

ELLIS L. YOCHELSON

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March 31, 1850–February 9, 1927

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CHARLES DOOLITTLE WALCOTT was born at New York Mills, New York, March 31, 1850, and died of apoplexy at Washington, D.C., on February 9, 1927. During his lifetime he had a scientific range which stretched literally from the dawn of life on the planet earth to the dawn of the space age. He was a man preeminent in science within the Federal government and within the scientific community of the country as a whole. He was one of the more important members of the National Academy of Sciences and perhaps did as much as any other president of the Academy to help that organization develop its preeminence in the American scientific scene.

He was an excellent scientist in his own chosen field of geology and paleontology and yet curiously, in spite of all his accomplishments, he is virtually unknown as the important historical figure he was in the development of science in America.

EARLY LIFE IN NEW YORK

Charles D. Walcott's predecessors came from Shropshire, England, and his first American paternal ancestor, Captain Jonathan Walcott, of Salem, Massachusetts, died in 1699. His grandfather, Benjamin Stuart Walcott, moved from Rhode Island in 1822 and became one of the leading manufacturers in

central New York. His father, Charles D. Walcott, a man of unusual energy, was well established in business, and held an influential and leading place in his community. Unfortunately, he died at the age of thirty-four, leaving a wife and four children, the youngest of whom was the two-year-old Charles Doolittle Walcott.

Walcott began his education in the public school system of Utica, entering in 1858, and thence to the Utica Academy, ending his work, but not graduating, in 1868. Thus his formal schooling occupied ten years and was completed when he was eighteen years of age. In view of his lack of formal higher education, his accomplishments in later life are even more remarkable. There is some indication that he may have been urged to consider the ministry, but after leaving the Utica Academy, Walcott entered a hardware store as a clerk and continued in this occupation for one year, acquiring practical business training which later proved to be of considerable use to him.

In 1871 he visited Indianapolis, Indiana, where a business partnership was offered to him on favorable terms; if he had accepted, his responsibilities would have left little time for study and investigation. On the other hand, if Walcott were to devote his life to science, it was necessary that he relinquish the opportunity for financial success and secure more time for his work. Upon returning from Indiana, he decided in favor of science and therefore left the business world forever.

Walcott's scientific bent had begun to develop at the age of thirteen when he started systematic collecting of birds' eggs and minerals. One day he was out looking for leaves with some companions when he saw a man carrying what seemed to be several stems of plants in a basket. These turned out to be the handles of geology hammers and the man was Colonel E. Jewett, a geologist, paleontologist, and conchologist, well

known in the early studies of natural history in New York State. He had a profound influence on the young Walcott, lending him books and giving him many suggestions.

Several years later, as Walcott recalled in a sketch written in 1916, when he was driving a wagon the wheel hit a drift-block of sandstone and split it open. Walcott recognized within it an apparently anomalous association of Upper Cambrian and Ordovician fossils. He noted, "The following winter I endeavored to locate the stratigraphic position of the associated trilobites but could not, further than that they were evidently of a pre-Trenton age. This study aroused an interest in the American early Paleozoic fossils that gradually led me to take up the Cambrian rocks and faunas as my special field of research."

He also noted, later in his career, "As a boy of 17 I planned to study those older fossiliferous rocks of the North American Continent, which the great English geologist, Adam Sedgewick, had called the 'Cambrian system' on account of his finding them in the Cambrian district of Wales."

As soon as Walcott returned from his business trip to Indianapolis in 1871 and cast his die for science, he moved to the farm of William P. Rust at Trenton Falls, New York. He arranged with Mr. Rust to do a certain amount of farm labor for his board and lodging, reserving the remainder of his time for study and field work. This rather unusual arrangement was maintained for five years.

During the early part of his stay on the Rust farm, Walcott was married to Lura Ann, the youngest of eight children in the family; after but sixteen months the marriage was terminated by the death of his wife.

The Rust farm provided what was perhaps a unique opportunity for collecting fossils, for in this area trilobites with appendages were preserved. The trilobite, a curious tri-lobed

creature related to the crustaceans but obviously distinct from them, is a fossil that has always generated extreme interest, perhaps second only to the large dinosaurs. Its systematic position within the animal kingdom was poorly known and Walcott's study of the trilobite appendages, particularly the specimens from the Rust farm, was an important link in resolving the enigma surrounding the zoological placement of trilobites.

In 1873 Professor James Hall of the New York State Geological Survey in Albany, New York, expressed considerable interest in Walcott's collections and at one time negotiated toward buying them for thirty-five hundred dollars, a considerable amount of money in those days. The transaction with Hall was not completed, but Hall informed Walcott that Louis Agassiz of the Museum of Comparative Zoology at Harvard College was interested in obtaining a collection of fossils. Walcott immediately wrote to Agassiz and made arrangements to sell him the collection. In Walcott's letter to Agassiz, he notes that "Professor Hall and many geologists from Europe and America have pronounced the collection of trilobites and crinoids the finest known from the Trenton group; 325 entire trilobites; 190 crinoids; 6 starfish; 15 or 20 cystoids; and of corals, brachiopods, many new species; 175 species from the Trenton group; and, as Professor Hall said, 'It is the best collection I have seen and we must have it.' Serious financial difficulties is the reason for his giving it up." Not only did Walcott sell his collection to Harvard, but he made arrangements to go to Cambridge and study under Louis Agassiz.

In 1919 Walcott wrote, "In September of 1873, I said to Professor Louis Agassiz that if opportunity offered I would undertake, as one bit of future research work, to determine the structure of the trilobite. This promise has kept me at the problem for the past 45 years." Unfortunately, Walcott's plans for further formal education at Harvard were wrecked when Agassiz unexpectedly died shortly after the fossil sale.

Walcott remained on the Rust farm collecting and studying until the fall of 1876. In November 1876, Charles D. Walcott received his first official appointment in the field of geology. He became the assistant to James Hall, State Geologist of New York. During the two and a half years he spent as Hall's assistant, he had the opportunity to collect and study the earlier Paleozoic rocks, not only in New York, but also briefly in Ohio, Indiana, and Canada.

Hall was a most remarkable man, certainly the dean of American paleontologists. He produced more works in the field of paleontology than any other American. At the same time, it must be admitted that Hall can best be described as an irascible tyrant toward his assistants. To this day, legends of Hall's temper and temperament persist among paleontologists. It says perhaps as much for Walcott as anything else that James Hall always spoke highly of him and that, further, Walcott has as one of his earliest claims to fame the fact that he published under his own name while an assistant to Hall.

THE GEOLOGICAL SURVEY

On March 3, 1879, the United States Geological Survey was established by Act of Congress. Organization of the Geological Survey was earlier recommended by a committee of the National Academy of Sciences to consolidate the several overlapping and competing geographical and geological surveys of the western United States. James Hall recommended his assistant for a job to Clarence King, who was then busy organizing his survey. On July 21, 1879, Walcott joined the U.S. Geological Survey as employee No. 20, at the salary of $600 a year for an assistant geologist. On July 1, 1880, he received a promotion doubling his salary. He remained with the Geological Survey as a full-time employee until 1907.

Immediately upon taking the oath of office in 1879, Walcott was assigned to assist Captain C. E. Dutton, working in the

Grand Canyon Region. Dutton sent him to south-central Utah to make a stratigraphic section from the summit of the pink cliffs to the mouth of the Kanab River.

Several pages in the Second Annual Report of the Geological Survey are devoted to Walcott's work in determining the boundary between the Permian and Triassic strata in the region of the Grand Canyon. Walcott spent the winter completing his report on the geology of the Kanab and identifying the fossils collected. Immediately thereafter he was assigned to the Eureka District as an assistant to Arnold Hague. In the Second Annual Report, Hague wrote, "Mr. Walcott's detailed study of the paleontological material shows 359 species in the collection. Of these, 299 have been specifically determined, the remaining 60 receiving only a generic name as here either imperfectly represented or, as in the case of the Devonic-Trenton fauna and Devonian corals, it appeared best to await the collection of more complete material before attempting to illustrate them. The Cambrian fauna, embracing both the middle and upper divisions, contains 119 species, of which no less than 63 have been identified as new." Walcott's first major paleontological paper, *The Paleontology of the Eureka District,* appeared as Monograph 8 of the Geological Survey and to this day remains a standard reference for many of the Paleozoic fossils and formations in Nevada.

On July 1, 1882, Walcott was placed in charge of the Geological Survey's Division of Invertebrate Paleozoic Paleontology. Shortly thereafter, he returned to Eureka, Nevada, to collect additional material and to examine other localities in the state. Upon completion of his work, he returned to the Permian and underlying strata of the Kanab region; the winter of 1882 was spent in the depths of the Grand Canyon.

He descended from the Kaibab Plateau, on a trail originally built by Major John Wesley Powell, to a platform 3,000 feet

below the level of the Plateau. His assistant was unable to endure the depression caused by living in these depths and finally left him, so that for a while Walcott conducted many lonely climbs in an exceedingly dangerous region. During this work Walcott ascertained the relationships of the pre-Cambrian Chuar and Unkar series in the Grand Canyon group, and discovered remnants of Devonian strata previously unknown in the Canyon. Major Powell, the second Director of the Geological Survey, indicated that his work resulted in "discoveries of the highest interest and value." Walcott is seldom considered to be a geologist who contributed a great deal to knowledge of post-Cambrian strata or one who was particularly occupied with the geology of the western United States, yet his contributions in this field as part of his early work on the Geological Survey are basic.

In 1883 Walcott was again promoted, this time to the position of paleontologist of the United States Geological Survey. During this field season he examined Cambrian rocks in the eastern area of the Adirondack Mountains and in northwestern Vermont. Walcott early demonstrated his astute ability in administration and had various assistants collecting Cambrian and other fossils for him elsewhere in the region. Most of his time was spent in completion of the Eureka report.

Although Walcott was a member of the Geological Survey, in 1892 he was appointed as Honorary Assistant Curator in charge of Paleozoic Fossils for the United States National Museum. In 1894, during a partial reorganization of the Museum, he was in charge of all the paleontological collections. It is perhaps worth noting that, since the very earliest days, the paleontologists of the United States Geological Survey and the United States National Museum have been associated most closely not only in their work but also in their physical location. Although most of the Geological Survey at this time was

quartered in the old Hoee Iron Building, the present site of one of the movie theaters on "F" street in Washington, the paleontologists on the Geological Survey were located in the Arts and Industries Building of the Smithsonian Institution, their offices stretching along the south side of the building on the first floor. This building, which was completed in 1881, mainly to provide housing for some exhibits left over from the Philadelphia Centennial Exposition of 1876, is noteworthy only in that it was the cheapest office building per cubic foot of space ever constructed in Washington. As office space, it left a good deal to be desired and almost immediately the collections of the Geological Survey began to crowd the paleontologists.

In 1884 Walcott continued his field work in the Cambrian of western Vermont, but was interrupted to examine a coal deposit in central Arizona. After leaving Arizona, he visited the Lower Paleozoic of the central mineral region of Texas where he discovered the Llano series which he correlated with the Grand Canyon group.

In 1885 he returned to central Nevada to examine the Cambrian in the Highland range. He also discovered a great series of Devonian and Mississippian strata in central Nevada. Finally, he measured sections of the Permian in southwestern Utah and Cambrian in the Wasatch Mountains near Salt Lake City. During the winter he continued his work of identifying fossils, and prepared a paper on classification of the Cambrian system of North America which was presented to the National Academy of Sciences.

In 1886 Walcott continued his field work on the Cambrian of northern and northeastern New York and western Vermont, and in 1887 he extended his field work from Washington County to Rensselaer County in New York. He also visited Cambrian strata near North Attleboro, Massachusetts. The result of this work was to prove that E. Emmons, one of the

earlier geologists in New York State, was correct and his former employer, James Hall, was incorrect in his interpretation of the area. At the same time, Walcott was able to demonstrate that Emmons had erroneously included younger rocks in his succession, especially in the complex area of Cambrian overthrust onto younger rocks. With this work he settled, at least for a time, the Taconic system which had troubled American geology for forty years.

In 1888 Walcott made one of the major discoveries in the Cambrian of North America. Geologists and paleontologists in Europe, particularly in the Scandinavian countries, had suspected there were some fundamental mistakes in the work of the earlier Americans in this field. Since the European section indicated that two major zones of Cambrian trilobites were reversed in America, Walcott conducted an investigation along the Canadian-Vermont boundary and then went to Newfoundland, where he was able to determine that the pioneer work there which had outlined a sequence of earlier and later Cambrian rocks actually was in an overthrust sequence. Thus the sequence in Europe was correct and that in the American literature was in error.

As good fortune would have it, Walcott immediately went from the field to the International Geological Congress in London where he was able to present his findings. This trip to Europe—which was also a honeymoon—gave him the opportunity to visit the classical sections of the Cambrian in Wales. Upon his return to Washington that year, he was placed in charge of all invertebrate paleontology in the Geological Survey. The year 1888 also marked the publication of his monumental second large work, *The Fauna of the Olenellus Zone,* in which Walcott clearly delineated the early Cambrian fossils of North America.

In 1889 Walcott extended his field experience in the Cam-

brian, examining outcrops in North Carolina and Tennessee. Later in the season he continued his work in the Mohawk Valley near Lake Champlain and visited localities in Quebec, traveling from there eastward to Vermont. His work in Canada permitted correlations between the geologic formations of Vermont and Canada on the western side of the Green Mountains. Later that year, he also did some work in west-central New York State to establish some correlations in the Middle Ordovician rocks. During the office season, not only did he determine fossils for other members of the Survey and write his papers, but he also made progress in installation of the various collections of fossils in the National Museum.

In 1890 he completed another major work, *Correlation Papers on the Cambrian.* That year he again examined Cambrian strata in New York and Vermont and visited the area near Canyon City in Colorado Springs, Colorado. It was during this trip that he recognized the occurrence of fish-plates in the Ordovician strata, the earliest known record of vertebrate life.

In 1891 he made a brief visit to Trenton Falls and continued his field work from Natural Bridge, Virginia, southward along the Appalachians to Alabama.

In 1892 Major John Wesley Powell, then Director of the Geological Survey, experienced serious difficulties with Congress, stemming from his restrictive policy toward western public lands; the appropriation of the Geological Survey was greatly reduced. Walcott had been placed in charge of all paleontologic work in 1892 and on January 1, 1893, was given control of administrative matters relating to geology, with the title of Geologist in Charge of Geology and Paleontology. Most of 1893 was spent in the preparation of a paleontological exhibit for the Columbian Exposition in Chicago, though in the autumn he made a short trip to examine Lower Paleozoic rocks in New Jersey, Pennsylvania, and eastern Tennessee.

The following year, it became increasingly apparent that Major Powell was anathema to certain members of Congress and that the only way for the Geological Survey to survive was for Powell to resign. In April 1894 he submitted his resignation as Director of the Survey and, on Powell's recommendation, President Grover Cleveland immediately appointed Charles D. Walcott his successor.

Although Walcott had an excellent reputation, he was by no means the most eminent scientist on the Geological Survey. If this title belonged to anyone, it probably belonged to G. K. Gilbert. There is strong evidence in unpublished letters to suggest that not only was Gilbert not opposed to this directorship for Walcott, a position which he presumably could have gotten, but that indeed he favored it. As noted in the obituary on Walcott written by Darton, Walcott's choice was one highly acceptable to geologists all over the world, and was especially so to most of the personnel of the Survey, which had always been "sensitive to its internal relations and difficult to keep properly enthused." It was also believed that Mr. Walcott could influence favorably the higher governmental officials and the Congressmen who provided funds for the organization. This judgment was eminently correct.

At the time Walcott became Director, the appropriation for the Geological Survey was $495,990. In his first year he obtained an increase of $22,000 for the regular budget of the Survey and an additional $50,000 to study hydrologic resources, an investigation which had begun under Powell's administration but which had led to Powell's downfall.

Between 1894 and 1898 the functions of the Geological Survey were enlarged by Walcott to cover the mapping of forest reserves, investigations of surface and underground water, surveys in Indian reservations for the Land Office, and the establishment of boundaries in western states. As a result, appro-

priations were increased to $967,840, more than double what they had been when Walcott first took over the Geological Survey.

In spite of an arduous load of administrative work, Walcott continued to do some field work. In 1894 he spent some weeks in central Colorado, and then made a reconnaissance in the White Mountain Range along the California-Nevada line. During the summer of 1895 he spent some time in Montana and Idaho and in September made a reconnaissance of the Cambrian around Columbia Falls, Montana. In 1896 he made a geologic reconnaissance into eastern California and western Nevada, examined the Franklin Mountains near El Paso, and continued his office work on fossils. In 1897 he devoted most of his field season to examination of forest reserves and national parks. In 1898 he spent some time around Lexington, Virginia, and then later visited Teton Forest Reserve in Wyoming and the Belt Mountains east of Helena, Montana. In 1899 he returned to New Brunswick and Newfoundland.

During 1898 Walcott published Monograph 30 of the United States Geological Survey, *Fossil Medusae,* a work of more than 200 pages. Although there are some who today question the scientific merits of the material on which he worked, this again is a classic in its field. It was Walcott's third major contribution and was in addition to the numerous short papers published since his first in 1875.

Walcott's work on the forest reserves is most interesting and is a reflection of the methods that he was able to use later in his life in so skillfully directing the course of science within the Federal government. During the 1890s, with the rise of a conservation movement in the United States, there was considerable pressure toward preservation of our natural resources and particularly in the establishment of forest reserves. Some, but by no means all, of this pressure was spearheaded by Gifford

Pinchot. It is perhaps interesting to note that the only time Pinchot spoke before the National Academy of Sciences he was presented by C. D. Walcott.

In 1891 Congress granted authority to the President to set aside, as public reservations, public lands bearing forests. By the fall of 1893, some 17 million acres had been reserved. Unfortunately these lands were little tended, and cutting of timber and destruction by fire went on essentially as before. Shortly thereafter, the Forestry Commission of the National Academy of Sciences was appointed, with Gifford Pinchot as secretary and the geologist Arnold Hague as one of its principal members, to examine the various forests of the United States and to make recommendations.

Upon recommendation of this Commission, thirteen additional forest reserves containing an aggregate of 21 million acres were established. This action was followed by strong opposition to the policy of forest reserves.

According to Walcott, in a letter recommending the establishment of the forest reserves, the Forestry Commission stated, in effect, that it had purposely recommended very large reserves in order to create a public sentiment which would cause Congress to enact laws securing the proper administration of the reserves. The result of establishing the reserves more than met the anticipations of the Commission that legislation would follow! Thus, early in March, Congress inserted in the Sundry Civil Bill an amendment revoking the forest reserve proclamations and repealing the authority for setting aside public forested lands. The bill failed because President Cleveland did not sign it. When Congress reassembled in the middle of March 1897, agitation against the reserves resumed. Fortunately Walcott was able to beat down the opposition that would have turned over all forest lands to private companies for exploitation.

At the suggestion of Senator Pettigrew of South Dakota, an amendment was drawn up for the Geological Survey to administer the forest reserves. This amendment met with the approval of the Secretary of the Interior and the President, and was presented to the Senate in modified form on April 6, 1897. After various committee actions, when the Sundry Civil Bill was under consideration, this amendment was offered to the appropriation for the Geological Survey. After discussion in the Senate it was accepted on May 6 and went to the Conference Committee between the Senate and House.

On June 4 President McKinley signed an act containing the forest reserve legislation. As Walcott modestly wrote, "The period between March 4th and June 4th was a strenuous one for those directly interested in the protection and utilization of the public forests." The new law was not ideal but it was all that could be obtained under the conditions then existing.

In 1905 Walcott could report that five forest reserves had been completely mapped and work had been commenced in 29 other reserves. Reconnaissance maps had been made of 12,000 square miles of forest reserves in Idaho and maps for almost 49,000 square miles, not counting these reconnaissance maps, were ready to be published. The forests were being classified by timber cruisers; the land classed as to arable, pasture, wooded, and so forth; the subject of fires was being considered from a scientific standpoint; streams were being studied as a mode of transporting lumber; the problems of road building for lumbering purposes were considered; effects of grazing were being investigated; and the future marketing prospects for forest products were also being studied. Thus had the work of the Geological Survey been diversified.

In 1888, as a result of John Wesley Powell's astute political maneuverings, the Director of the Geological Survey had been authorized to investigate the extent to which arid

lands might be reclaimed. Surveys of reservoir sites and catchment basins were begun, and it was Powell's action in withdrawing public land from settlement until it could be classified that led to his subsequent problems with Congress.

Walcott built strongly on the foundation that Powell had created and extended it by recognizing the necessity of holding forested areas above reservoirs at river sources. He insisted upon close cooperation between engineers engaged in study of water supply and the men investigating forest reserves. Although the work of the Reclamation Service, in part, stems from the forestry work, it also can be traced to the July 1, 1900, reorganization of the scientific work of the Geological Survey by Walcott. The effective table of organization instituted then permitted him in 1902 to form the Hydrographic Branch, which in turn later gave rise to the separate Reclamation Service.

The Reclamation Service, of course, was in an extremely sensitive area, as in some cases it was necessary to recover private land for public government projects and in other instances government public land was turned over to individuals. In spite of the serious pressures that arose from this sort of work, the Reclamation Service was highly successful. In 1906 it was practically severed from the Geological Survey with the Director and the Chief Disbursing Officer the only two employees in common; shortly thereafter it became a separate government agency under F. H. Newell.

The years immediately preceding and following the turn of the century were unusual in the United States for the large number of expositions or "fairs" which were held. Curiously enough, they played an important part in the history of the Geological Survey, for the Louisiana Purchase Exposition held in St. Louis ultimately led to the creation of another government bureau. In 1904 the Geological Survey, as part of its

exhibit in St. Louis, had conducted a series of experiments on the combustion of coal and lignites, under the direction of the Division of Mineral Resources of the Survey. The work thus started in the analysis and testing of fuels was broadened in 1905 to include investigation of structural materials. This work gave rise to the technologic branch of the Geological Survey established in the spring of 1907 and placed in the charge of J. A. Holmes. In 1910, shortly after Walcott left the Geological Survey, the personnel of the technologic branch became the nucleus of the Bureau of Mines, with Holmes as its director.

In spite of his heavy load of administrative work, Walcott still continued to study the Cambrian. In 1901 he took a field trip to New Mexico and Arizona, including another trip to the Grand Canyon. N. H. Darton notes that part of the time he was with Walcott and they lived in a private railway car furnished by the Santa Fe Railroad. In the fall of 1903 Walcott visited the Uinta Mountains and then spent considerable time on the House Range of western Utah and the Snake River Range of eastern Nevada, though he was then also serving on a Presidential committee to investigate scientific work of the Government and as United States Commissioner on the Canadian Boundary Commission. In 1905 he spent some time in the field along the Rocky Mountain front and near Ravalli, Montana, and made further studies on the Cambrian in the House Range of Utah.

It is difficult to sum up Walcott's work as Director of the Geological Survey except to use the words "fantastically successful." At the time he took over administration, the personnel of the organization were dispirited and the administration was nearly wrecked by lack of support in Congress. In the course of his thirteen years as Director, he built the Geological Survey into a preeminent scientific institution. Morale of the employees was excellent, the scientific work was of the highest caliber,

and yet throughout it all Walcott never denied the policies of his predecessor. If any short summary is appropriate, he can perhaps best be given credit for carrying out the policies that Powell instituted.

Indeed, in 1911 Walcott wrote to President Taft requesting that the words "soldier, explorer, scientist" be engraved on a monument to Powell in the Arlington National Cemetery. He stated, "If ever a man deserved to have such a recognition, he certainly did. He was my chief for 12 years as Director of the Geological Survey and I learned to appreciate and admire his unusual character and qualities."

Walcott's years on the Geological Survey were also personally happy. In 1888 he married Miss Helena B. Stevens of Rochester, New York, and with her he had a family of three sons and one daughter.

SMITHSONIAN INSTITUTION

In the fall of 1896, G. Brown Goode, Assistant Secretary of the Smithsonian Institution, died. Walcott was immediately offered this position but declined to leave the Geological Survey. After much persuasion, however, he agreed to accept the job of Assistant Secretary of the Smithsonian Institution in charge of the National Museum. He did this without leaving the Geological Survey and accepted it only on a temporary basis so that he could continue to pursue his scientific studies without becoming deeply involved in Museum administration.

By July 1, 1897, six months after being appointed, Walcott had instituted a major revision of the U.S. National Museum organization, much of which survives today. That his basic organization has remained essentially *in toto* for sixty years is yet another example of his administrative ability.

On February 27, 1906, Samuel Pierpont Langley, the third Secretary of the Smithsonian Institution, died. Although it

would have appeared most logical for the Board of Regents immediately to offer the secretaryship to Walcott, they did not do so. Rather, it was offered to Henry Fairfield Osborn of the American Museum of Natural History, who declined the position. It was subsequently offered to Walcott, who accepted, and, on January 31, 1907, he was appointed fourth Secretary of the Smithsonian Institution by the Board of Regents. Contemporary newspaper accounts suggest strongly that President Theodore Roosevelt desired Walcott to remain as Director of the Geological Survey, and indeed, although he was appointed in January, he did not leave the Geological Survey until four months later. Apparently only considerable pressure from the Smithsonian Regents was able to persuade Roosevelt that the needs of the Smithsonian were as important as those of the Geological Survey.

Walcott was six feet two inches tall with an athletic build. Associates recall that he used to stride through the Smithsonian halls with his overcoat thrown over one shoulder. One or two persons have used the term "patrician" to describe his bearing. There was never any doubt in the eyes of anyone who observed him that he was the executive officer.

Under Walcott's direction the Smithsonian Institution continued to grow. It was during the early part of his administration that the so-called New Museum, the Natural History Building at 10th and Constitution, was completed and occupied by the staff. Expansion in the new quarters permitted the National Museum to grow, and the move from the old Arts and Industries Building to the Natural History Building must surely rank as one of the landmarks in Smithsonian history. It was not always an easy life for the museum personnel, as the building was temporarily closed to the public on July 16, 1918, during the closing days of World War I. The Bureau of War Risk Insurance began using the Museum as office space

during October 1918 and did not return it until April 1919.

Because of his interest in nature and conservation, the creation and utilization of national parks was a favorite project of C. D. Walcott. He did not carry the brunt of action in this field and his contribution is difficult to assay. Certainly he laid some of the ground work for the National Park Service, if only because of his contact with Theodore Roosevelt. On several occasions he gave testimony to Congress, particularly in regard to the establishment of Glacier National Park. When the Service was finally started in 1916 under Stephen T. Mather, it almost immediately came under attack by local interest groups. Walcott thereupon helped organize the National Parks Educational Committee in June 1918 and was its chairman. This nongovernmental committee gave needed support to the National Park Service. The following year this committee gave rise to the National Parks Association, and in this organization Walcott was Vice-President, President for three years, and finally member of its Executive Committee. His interest in parks and outdoor recreation continued until his death, but because his activity was less direct than in other fields, park preservation does not form a separate facet of his career.

Walcott was equally active in other fields that are now currently associated with the Smithsonian but at that time were not thought to be part of its mission. While the National Collection of Fine Arts—at that time called the National Gallery of Art—had been founded shortly prior to his assumption of the secretaryship, there was at least one major lawsuit pending which very much clouded the question of whether there really was a "national gallery of art." He was able to arrange for this suit to be settled to the satisfaction of the Smithsonian and the country as a whole. In 1920 he had the foresight to set up the National Gallery of Art as a separate administrative entity.

Perhaps even more important were Walcott's administrative

contributions in the field of Oriental art. As is well known, Charles Freer of Detroit donated to the Smithsonian a large collection of Oriental art which is now currently housed in the Freer Gallery of Art. This collection was originally to have been willed to the Smithsonian upon Mr. Freer's death. Subsequently, Freer modified his bequest, contributed a million dollars to the Smithsonian for the preparation of this magnificent gallery, and lived to see the collection installed.

Dr. Frederick H. Seares of the Mt. Wilson Observatory has written me: "During a day in 1915, while in Dr. Walcott's office, I asked him what lay behind the change in plan? It really was a very simple matter, he replied." Continuing, he said in substance, "We had only to point out to Mr. Freer that if the collection could be transferred to Washington in the near future, it would be of immense value to us during the period of construction and installation. We would be able to draw upon his intimate knowledge of the history of the objects and their significance and to have his advice as to the most effective method of their presentation to the public. We thought, too, that he might find satisfaction if the collection could be displayed during his lifetime in a manner that had his approval."

Curiously enough, in spite of Freer's generosity to the American public, it was deemed a requirement by the Secretary of the Treasury that Freer pay an income tax levy on the profit from sale of bonds used to raise the construction money for the Freer Gallery. Although Mr. Freer protested and Secretary Walcott protested, the Treasury was paid its due. Subsequently, after Mr. Freer's death, Walcott arranged for Congressional legislation to return the amount of the tax payment to the Freer estate.

Throughout the twenty years Walcott was at the helm of the Smithsonian Institution he continued his scientific work. Standing regulations for many years around the Smithsonian

were that he was to be disturbed only between the hours of ten and two. Preceding and following this time he retired to his small workroom on the third floor of the "castle" and wrote his voluminous manuscripts.

The Geological Survey published Monograph 51, *Cambrian Brachiopoda,* by C. D. Walcott, in 1912. This magnificent work of 872 pages and 104 plates will certainly stand as a monument for all time as a primary reference in the study of Brachiopoda. In contemporary correspondence, Walcott noted that as author of the work he had received only one copy, but since he still had some influence with the current director of the Geological Survey, he would attempt to obtain a second copy for his correspondent. As a matter of fact, Walcott maintained his Geological Survey appointment until June 1909, partly to complete this work but mainly for the sentimental reason of completing thirty years' service with that organization.

THE CARNEGIE INSTITUTION

In 1901, while he was still Director of the Geological Survey, Walcott along with a small group of friends appealed to Andrew Carnegie to found a research institution in Washington. According to legend, Walcott was sitting at breakfast with Carnegie, and Carnegie asked him to tell something of "James Smith" who founded the Smithsonian Institution. Walcott proceeded to tell the story of Smithson's bequest and the work of the Smithsonian so effectively that Carnegie eventually gave 10 million dollars to establish the Carnegie Institution of Washington. Walcott was delighted with this boon to science, and, in his characteristic manner, aided the Institution as secretary of the Board of Incorporators, then secretary of the Board of Trustees, and secretary of its Executive Committee until 1905. He continued as a member of the Executive Committee until 1922, as its chairman for the last six years of his

service thereon. He continued as vice-chairman of the Board of Trustees from 1913 until his death.

Although the Carnegie Institution, preeminent as a scientific organization today, is well known for the work of its various laboratories, much thought, considerable discussion, and not a minor bit of wrangling went into its planning before it developed to its present-day form and function. Certain of the incorporators desired something akin to a university, whereas Walcott was clearly and outspokenly in favor of solely a research institution. Other incorporating members of importance, as well as Andrew Carnegie, were very much opposed to the concept of buildings for the Institution. They preferred that the money be spent primarily in grants to support particular individuals, a mode of financing which certainly has its merit. Walcott, however, argued strenuously that it was necessary to provide the proper facilities for outstanding scientists to do their work.

If the eminent petrologist, the late Arthur L. Day, may be considered the father of the world-famous Geophysical Laboratory of the Carnegie Institution, certainly Charles D. Walcott deserves to be considered as its grandfather. Not only did he, as Director of the Geological Survey, arrange for Day to visit Europe and examine various laboratories in order to make proper recommendations to the Board of Trustees, but when Andrew Carnegie expressed dismay that the Board of Trustees had voted to construct the laboratory, Walcott debated the point with him in letter and was able to persuade Mr. Carnegie to change his mind.

Frederick H. Seares of the Mt. Wilson Observatory has written me: "We at Mt. Wilson always had a feeling of gratitude to Dr. Walcott. In large degree he was responsible for the existence of the Observatory. It was Walcott's warm support of Hale's enlarged program that ensured its adoption by the Trustees of the Carnegie Institution of Washington."

Walcott had such a broad view of science that, as a member of a committee on the needs of paleontology, when the needs of various other sciences were being surveyed by the Trustees of the Institution, he recommended that the Institution concentrate more on other fields. At the same time, Walcott recognized that this privately endowed institution was able to do jobs which were not available to governmental organizations. At his request and with his backing, the Carnegie Institution sent a small expedition, headed by the late Bailey Willis, to China. Walcott's work on the collections from the Cambrian of China resulted, once again, in a large monograph. When Eliot Blackwelder, who went along as the collector of fossils on the expedition, reported that he had brought back nearly a ton of material, Walcott wanted to know why more had not been collected!

THE RESEARCH CORPORATION

In 1911 J. A. Holmes, Director of the newly organized Bureau of Mines, introduced Walcott to Frederick Gardner Cottrell, inventor of the Cottrell precipitator. It was Dr. Cottrell's hope that he could turn his patent rights over to the Smithsonian Institution "for the purpose of creating a fund from the business development of these patents which could be used for research to carry forward not only these special lines, but any lines of human endeavor." Walcott was naturally stimulated by this idea and approached the Executive Committee of the Board of Regents. After some discussion, late in 1911 the Regents deemed it advisable that, rather than the Smithsonian being directly involved, there be organized a separate stock corporation "in which the Institution would be represented by the Secretary as an individual and not in his capacity as Secretary."

Unconfirmed reports have it that William Howard Taft rendered the legal opinion as to the inappropriateness of the

Smithsonian's holding the patents and suggested the formation of a stock company, which eventually became the Research Corporation. Indeed, he is supposed to have handwritten the original draft of its incorporation. Within fifty days, by February 4, 1912, Cottrell and Walcott together had recruited an eminent Board of Trustees from among the leaders of industry and science and had the articles of incorporation ready to be filed. Walcott was listed as Vice-President.

The Corporation started with a sum of $10,000. It was not until 1915 that the Corporation made enough money to buy back its stock from the stockholders. Interestingly enough, the Corporation is set up with a statutory limit as to the maximal age of the Board of Directors in order to be sure that young men with young ideas will continue to be in charge. Although the Corporation was somewhat limited financially before 1939, since that time it has rapidly moved up into the ranks of philanthropic organizations as a fund-granting institution. Certainly, it performs a most valuable function to other nonprofit institutions and universities in giving advice regarding the holding and handling of assigned patents.

In point of fact, prior to World War II, the Research Corporation was in a position to supply money for only nine scientific investigations. One of the first grants made and one of the few granted during Walcott's lifetime was to Robert H. Goddard, the father of the modern rocket. The Smithsonian, through Assistant Secretary C. G. Abbot and Dr. Walcott, had previously granted Goddard a small sum of money. This Research Corporation money permitted him to continue with his pioneer investigations, which culminated in the first successful liquid fuel rocket in 1926.

A second project was a series of grants to the Smithsonian for study of the sun and associated phenomena. The money led eventually to the formation of the Division of Radiation

and Organisms, which has evolved into the federally supported Radiation Biology Laboratory. A third project was a series of grants to Drs. R. J. Van de Graaf and E. O. Lawrence. These grants in the field of nuclear physics were basic to expanding knowledge of atomic structure. Thus, partly through the vision, work, and organizational ability of Cottrell and Walcott, the foundation was laid for the present-day nuclear space age.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

The Smithsonian has long had a tradition of being the indirect founder of other governmental scientific institutions where there was need for them. Thus, under Joseph Henry, a weather service was established, and under S. F. Baird the Fish Commission came into existence. Walcott continued this tradition with the National Advisory Committee for Aeronautics. While this agency no longer exists, having been absorbed into the National Aeronautics and Space Administration, it was highly significant in the development of American aviation. The antecedents of this committee probably stem from the proximity of Walcott's paleontology office in the Museum to Langley's workshop.

Walcott notes that on March 21, 1898, he discussed the subject of a man-carrying airplane with Langley, who thought that such a venture would be a success and a great service. The following day Walcott asked him again if he desired to undertake the construction of such a large machine. Langley said, "Yes, if the money can be secured." In Walcott's account he stated, "On March 24th I called on President McKinley and talked to him about the Langley flying machine. He told me to see Assistant Secretary of the Navy Roosevelt and Acting Secretary of War Meiklejohn." As a result of this and several other conferences, Langley was given a "secret" mission to develop an airplane for the Spanish-American War. Langley's

efforts to build a full-scale machine were unsuccessful and eventually led to considerable ridicule from the press.

This early interest in aviation stayed with Walcott. Again he wrote, "When I became Secretary of the Smithsonian Institution in 1907, I felt that the aerodrome no longer needed special researches for its development, but from time to time in reading of practical work being carried on and in talking with practical men engaged in the work, it became apparent that there were still many things to be considered and work done before the science of aviation could be established on a permanent, practical basis."

In 1911 Great Britain established an advisory committee on aeronautics. Walcott knew of this development and some time later he organized an advisory committee on aeronautics. This preliminary committee eventually resulted in the formal National Advisory Committee for Aeronautics, the act establishing which was approved on March 3, 1915. At the organizational meeting Walcott naturally was elected chairman of the Executive Committee, a post which he held until 1919; at that time he was elected chairman of the full committee and retained that position until his death.

Early in June 1916 Walcott recognized the possibilities of impending war and the importance of the airplane long before many of his predecessors. He held the first general meeting of representatives of the American aircraft industry. Shortly thereafter, a subcommittee on power plants for aircraft was established and within twelve months this subcommittee had arranged for development of the Liberty Engine.

At about this time a serious patent war threatened to complicate the acquisition of airplanes by the government. Dr. Walcott and a subcommittee on patents evolved a cross-license agreement that brought an end to this controversy and made possible the establishment of a growing aircraft industry in

America. This agreement remains in effect to the present day. Shortly thereafter, when the United States entered World War I, Walcott was responsible for the organization of an Aircraft Production Board which eventually received appropriations of $640,000,000 from Congress.

A small sheet metal shed was erected on the Smithsonian grounds in 1917 for use of the Signal Service—later Air Service—in its developmental work on war aircraft. Walcott arranged for the Smithsonian to receive this building after the war. For some years it has housed important aircraft collections, and thus forms the nucleus of the National Air and Space Museum.

Walcott is also given credit for being extremely active in the field of aviation after World War I. He was one of those directly responsible for the founding of Langley Field as a place for aeronautical investigations. He was a leader in inaugurating airmail service; he was a prime mover in organizing the Committee on Aerial Photographic Surveying and Mapping; he helped formulate the first National Aviation Policy in 1920, and was one of those who drafted the Air Commerce Act of 1926. Curiously enough, Walcott was in the air on only a limited number of occasions.

Upon Walcott's death, a special meeting of the National Advisory Committee for Aeronautics passed a resolution which read in part, "We mourn his death as a loss to the entire scientific world and a distinct and irreparable loss to the science of aeronautics."

The field of aviation in which Walcott played such a prominent part was unfortunately also responsible for a controversy regarding the Wright brothers' airplane which troubled the Smithsonian for many years. Although no one ever questioned that the Wright brothers were truly the first men to fly in a heavier-than-air machine, Walcott clearly believed that Samuel

Pierpont Langley had not received ample credit for his pioneering efforts and he was persuaded to permit the Langley machine to be used in experiments long after Langley's death. With some modifications, the plane was flown and then subsequently was exhibited as the first airplane capable of sustained flight. As a result of this action the Wright airplane went to the British Museum, although shortly before Orville Wright's death the controversy was resolved and the machine was returned to the Smithsonian.

This contention resulted from Orville Wright's attempt to make sure that his deceased brother, Wilbur, received his due, whereas Walcott wanted to make sure that Langley received credit for his pioneer efforts. Unfortunately the controversy was headline news and was treated as such for years. It is all the more remarkable since it seems to stand as the main major error in judgment that Walcott made during his public life. Although it is not generally known, nor did it affect the partisan comments on either side, the principals in the argument treated it on a high impersonal level. Wright agreed to serve on NACA after World War I, and until Walcott's death the two sat at the same meeting table and worked together.

THE CANADIAN ROCKIES

When Walcott assumed the secretaryship of the Smithsonian Institution, although he inherited many administrative problems, he also was free of the responsibility of confining his primary geologic work to the United States. He had long been curious about the Cambrian of the Canadian Rocky Mountains and in the autumn of 1907 made an extended visit to British Columbia, where there are superb exposures of up to 12,000 feet of Cambrian strata, particularly in the Mt. Stephen–Lake Louise area. In 1908 he extended his observations into other portions of British Columbia and Alberta. In 1909, among other activities, he found a deposit of Cambrian

fossils near Burgess Pass above Field, British Columbia, at an altitude of 8,000 feet.

His work in the Canadian Rockies from 1907 until 1925 is best summarized in a series of exploration pamphlets (published by the Smithsonian Institution) which were profusely illustrated with panoramic photographs taken by Walcott. In 1925 he wrote, "This year probably completes my field work in the Canadian Rockies. A few problems have been cleared up in the past nine years but many remain to be studied by young well-trained men with strong hearts, vigorous muscles, and a high purpose of the research student seeking to discover the truth."

Walcott's work in the Canadian Rockies on the Cambrian strata and its fossils is significant and basic. Collectively it forms a foundation for the Cambrian of western North America which remains to this day. This work, together with a few other papers, fills five full volumes of the Smithsonian Miscellaneous Collections and aggregates nearly 2,500 pages plus accompanying plates.

While this is all steady, substantial, solid work, there is included one remarkable discovery. In 1910 Walcott was leading a pack train near the Burgess Pass (British Columbia) when he stopped to remove a slickened piece of shale from the trail. He automatically split the slab and was astounded to discover soft-bodied animals preserved as carbonized films. The party spent one week working their way up the mountain, splitting slabs until they found the position and place of this erratic block. Once the position had been found in place, Walcott proceeded to open a quarry and for many years, but particularly 1912, 1913, and 1917, he collected vast quantities of material from this unique locality. This quarrying was hard physical work and, according to contemporary accounts, C. D. Walcott personally did all the dynamiting that was required to release the fossil-bearing slabs. The Burgess shale fauna com-

prises more than 70 genera and more than 130 species of fossils. It is certainly one of the unique finds in paleontology, for several groups of animals in the Recent fauna are known in the fossil record from only this single locality.

The early years in the Rocky Mountains were a happy time for Walcott since he, with his family, could travel with a pack train and leave all the cares of administration behind him. However, shortly after beginning his work in the Canadian Rockies, he suffered heavy personal tragedy. His oldest son died while a student at Yale University; his wife was killed in a railway accident in 1911; another son, flying with the French Air Force, was shot down in December 1917.

It is characteristic of Walcott that, in the face of his own trouble, he could write to President Wilson from his camp in 1914, "A passing forest ranger told me of Mrs. Wilson's serious illness, and later delayed papers told of her passing onward. I sympathize with you most sincerely—I wish I could help you. Steady, systematic work is one's salvation at such a time of trial and surely you have more than enough of that."

If the earlier years in the Rocky Mountains were a time of personal tragedy for Dr. Walcott, he received his recompense in the later period. In 1914 he married Mary Vaux of Philadelphia and for the next thirteen years they enjoyed a most happy marriage and partnership. Mary Vaux Walcott was well known for her hand-painted illustrations of wild flowers of North America, later published by the Smithsonian Institution. Indeed, after his death, she continued to serve the American public and was at one time a Commissioner for Indian Affairs.

NATIONAL ACADEMY OF SCIENCES

At the 34th Annual Meeting of the National Academy of Sciences, April 21-April 24, 1896, Robert S. Woodworth, later President of the Carnegie Institution of Washington, and

Charles D. Walcott were elected to membership. The addition of these members brought active membership to 86. Although the National Academy, as originally conceived, grouped members into two classes—mathematics and physics on the one hand and natural history on the other—each of which contained five sections, this internal organization was abolished in 1872. There was no attempt to group members by scientific interests until 1899 when six standing committees were formed.

Walcott chose to be affiliated with Geology and Paleontology. The following year, in 1900, he also became affiliated with Biology, the Constitution of the Academy then stating that "a member who is eminent in more than one subject may be assigned to a corresponding number of committees." In 1911 the committees on Biology and Anthropology were reorganized. Walcott thereupon transferred to Zoology and Animal Morphology. Dual membership was permitted for another four years, but in 1915 the internal organization of the Academy reached essentially its present-day form. From 1916 until his death, Walcott was affiliated with Geology and Paleontology.

Walcott's predecessors in the Geological Survey, Clarence King, the first Director, and John Wesley Powell, the second Director, were members of the National Academy; neither was particularly active in NAS affairs. In contrast, Walcott set a most remarkable record for activity in the organization.

In 1898 he was elected Treasurer and held this post until 1902 when he resigned, apparently because of the press of business concerned with organization of the Carnegie Institution. In spite of his resignation as Treasurer, Walcott was elected to the Council of the Academy in 1902 and reelected in 1904. Along with this election, Walcott was appointed to the Committee on Publications, where he served for more than ten years. He was also chairman of the Committee on Historical Documents for ten years, served on the Committee on Finance

for nine years, was on the Committee for the Daniel Giraud Elliot Fund for ten years, was chairman of the Mary Clark Thompson Fund Committee for two years, and was a member of the Building Committee and the Committee on Exhibits. He was also chairman of the committee to arrange for the celebration of the semicentennial of the Academy in 1913. By all accounts it was a glittering affair, comparable in many ways to the centenary celebration in 1963.

It may be noted also that the three amendments to the Constitution of the National Academy of Sciences, all of which required approval by both Houses of Congress, were successfully steered through the Congress by C. D. Walcott.

In 1907 Walcott was elected Vice President of the National Academy and held this position until 1917. At the 1917 Annual Meeting, William Welch resigned as President to devote full time to the newly established School of Hygiene and Public Health at The Johns Hopkins University. Walcott was unanimously elected to succeed him. Being President in no way inhibited him from taking part in the scientific sessions, for in the six years of his presidency he presented four lectures before the Academy.

In 1921 Walcott planned to resign as President. A constitutional change in 1918 had modified the term of office from six to four years. Walcott wrote the Home Secretary, "I think that this would be in accordance with the spirit of the present Constitution, and I therefore present my resignation as President of the Academy to you, in order that you may notify the membership in sending out the notices for the Annual Meeting in April, 1921." The Annual Report of the Academy notes that Walcott felt, having served nearly twenty-three years as Treasurer, member of the Council, Vice President, and President, that he should be relieved in order that he could devote his entire time to research work. He also advised the election

of a younger man who could devote more time to important matters in connection with building the Academy and the Research Council and called attention to the able efforts of Mr. George E. Hale.

To quote from the Annual Report, "Upon motion of Mr. Hale, which was promptly seconded and adopted, the academy voted that Mr. Walcott's resignation be not accepted, and that he be informed that it was the earnest desire of the academy that he remain as president throughout the full term of six years for which he was elected. After much persuasion Mr. Walcott was finally prevailed upon to continue in office throughout the remainder of his term." Walcott thereupon continued to serve the remaining two years.

Although the National Academy of Sciences forms a prominent part of the present-day scientific scene, this was simply not the case when Walcott first was elected. After some able work under President Joseph Henry, the Academy probably reached its high point of effectiveness in recommending the formation of the Geological Survey.

Between 1863 and 1895, forty-nine committees were appointed at the request of the President, the various heads of Executive Departments, and the Congress. Forty of these requests came in the first twenty years of the Academy's existence. Some of the committees gave advice on such minor topics as Morphine Content of Opium Samples and the Separation of Ethyl and Methyl Alcohol. Only four of them, of which the Geological Survey Committee was the best known, potentially had any effect on permanent federal participation in science.

The semicentennial celebration in 1913 breathed new life into the Academy. This occasion was made the basis for starting a journal for the Academy and for revitalizing plans for a building fund and a permanent home. The monthly *Proceedings* was published first in 1915 but it was necessary for a new

home for the Academy to wait until after the close of World War I. Prior to the completion of this building, the activities of the National Academy for many years were carried on essentially in the office of the President and, because of earlier commitments through Joseph Henry, within the Smithsonian Institution.

In point of fact, for many years the office equipment of the National Academy of Sciences consisted of little more than a mimeograph machine. It was a high point when the annual minutes were able to report that the library of the Academy finally had been unpacked after many years and was available in one of the tower rooms of the Smithsonian Institution.

Indeed, the National Academy of Sciences as a concept and the Smithsonian as a building were so closely entwined that the will of Mrs. Mary Anna Palmer Draper in part reads simply, "I give and bequeath to the National Academy of Sciences, Smithsonian Institution, Washington, D.C., the sum of twenty-five thousand dollars."

Annual meetings were normally held at the National Museum or the Smithsonian building but occasionally the academicians met in the Capitol, the Library of Congress, a local college, and even at a church. A small group of men, in particular George E. Hale and C. D. Walcott, changed this situation. In no small measure, the mere fact of having a magnificent structure of its own has been a symbolic step in raising the prestige of the National Academy of Sciences to the present level that it currently enjoys.

Preliminary plans of the building were presented by Hale in 1914 but the matter was not officially mentioned again until 1919. In that year the Carnegie Corporation of New York expressed willingness to appropriate five million dollars provided the Academy would secure a suitable building site from other sources and design plans for a building that would ac-

commodate both the Academy and the Research Council. The present site was obtained, and final plans were drawn and contracts let in the fall of 1921. The cornerstone was laid on October 30, 1922, with Walcott being the first to place cement under the stone. Formal dedication was three years later.

Anyone who has lived in Washington knows that it simply is not easy to cope with the governmental structure. In order to obtain the land for the Academy, it was necessary to have upper Water Street closed by Act of Congress, and to square the block into an attractive shape it was necessary to convince the Army Chief of Engineers to transfer a small piece of government-owned land to the Academy. Walcott played a behind-the-scenes role in both these transactions.

Although Walcott had served the Academy with honor and distinction for more than twenty-five years, upon the completion of his term in the presidency the Academy still desired his services and, in 1924 and again in 1926, he was appointed by President Michelson to presidential committees on Timber Utilization and Outdoor Recreation.

One anecdote about Walcott deserves repeating. For the dedication ceremonies at the new National Academy of Sciences building, invitations were sent to all members of all local scientific societies in Washington. A Museum aide, who worked in his spare time as Walcott's privately paid preparator, received one of these invitations and an associate of his in the Museum prevailed upon him to go to the dedication. They arrived late and spent some hours strolling through the building looking at the exhibits. Near midnight, when most of the crowd had left, Walcott shook the man's hand and commented about how delighted he was that the preparator had come to see the building; then he chided him for not having come through the formal receiving line and informed him that on future occasions he should attend to such a matter of protocol.

In 1921 Walcott was pleasantly surprised in being the first recipient of the Mary Clark Thompson Medal established for distinguished contributions to the science of geology and paleontology. Walcott's memory has been perpetuated within the Academy through the establishment on April 18, 1928, by Mrs. Mary Vaux Walcott, of the Charles Doolittle Walcott Fund "to encourage and reward individual achievement in advancing our knowledge of pre-Cambrian life and its history in any part of the world." A medal and honorarium may be awarded every five years. The conditions of the medal were subsequently modified to include work on the Cambrian.

NATIONAL RESEARCH COUNCIL

Between 1917 and 1923, nominally only two pieces of governmental business came before the Academy. One was a request from the Senate Committee of Underwater and Underground Radio and the second, from the Secretary of Agriculture, concerned investigations of Kilauea Volcano in Hawaii.

It is obvious, however, that the National Academy of Sciences of this period cannot be considered separately from the National Research Council. The idea of the National Research Council came from the astronomer George E. Hale, who remained its driving force, but in Walcott he found a most sympathetic and helpful chief executive of the Academy. Indeed, it is questionable whether without Walcott and his prominent contacts in Washington, D.C., the National Research Council could ever have been organized or at least organized so promptly.

On April 19, 1916, the National Academy of Sciences voted unanimously "that in the event of a break in diplomatic relations with any other country the Academy desires to place itself at the disposal of the government for any service within its scope."

On April 26 the President of the Academy, accompanied by a committee of four members including Hale and Walcott, was received by President Woodrow Wilson at the White House and it was suggested that the Academy might advantageously organize the scientific and educational research institutions in the interest of national security and welfare.

In contrast to the staid Academy, the National Research Council was a lusty, fast-growing youngster. Within five weeks committees had been organized to deal with such pressing problems as nitric acid supply, synthetic organic chemistry, and preventive medicine.

At this time William Welch and George E. Hale sailed to Europe to study the organization and application of science in laboratory and field under wartime conditions. They reported in full to the first formal meeting of the National Research Council in New York City on September 20, 1916. At that meeting Hale was elected Chairman of the NRC; Walcott was elected First Vice Chairman, a position which he maintained for many years.

Although the NRC started with only 37 members, it expanded rapidly. By the end of 1916 it had been organized into 17 committees. Not only did Walcott serve as First Vice Chairman of the organization, he was also chairman of the Committee on Aeronautics, a member of the Committee on Geology, and, finally, chairman of the Military Committee, the function of which was to determine and screen governmental request requirements.

When the United States was finally embroiled in World War I, science, if not fully organized to do its share, at least had begun to apply the scientific method to waging war. Had it not been for this early organization of the National Research Council, the war-oriented scientific work could not have been mobilized as rapidly as it was. Because of its success, the Na-

tional Research Council was established as a permanent organization in 1917. The full story of NRC and World War I remains to be told, but throughout all the deliberations and efforts Walcott played an important part. John Victory, the first employee of NACA, recalls Walcott's mentioning that during part of World War I he was chairman or executive of thirty-two committees; not all of these were NRC-connected, however.

After the war NRC underwent major changes and reorganization; the death of chairman H. A. Bumstead in 1920 heaped a further burden on Walcott. In 1919 the NRC had been reorganized into Divisions of General Relations and Divisions of Science and Technology. Under the former was the Division of Government Relations, reconstituted in 1920 as the Division of Federal Relations. Walcott was chairman of this section, which was concerned primarily with governmental agencies dealing in scientific fields. This division was to be an advisory body, more or less coordinating the course of science throughout the Federal government. It is perhaps the closest approach that the United States has ever had to a department of science, even though it is recognized, of course, that the NRC is extragovernmental.

Unfortunately Walcott's attempt to organize this large and unwieldy group was unsuccessful. In part this may have been because of his age—he was then over seventy—and his fatigue from war-directed activities. In part, there may have been other factors in the Federal government's headlong return to normalcy. Regardless, one may speculate on what the effect of this attempt at an organization for science within the Federal government might have been. Assuredly, if it had led to a department of science, then Walcott would almost certainly have been that secretary.

THE CLOSING YEARS

When Walcott completed his term as NAS President in 1922, he also stepped down as first vice-chairman of NRC. However, he was elected second vice-chairman and served in this capacity, as well as chairman of the Division of Federal Relations, until his death.

There was yet one more honor for C. D. Walcott, for in 1923 he was elected President of the American Association for the Advancement of Science. This capped his career as a fellow, officer, and member of numerous scientific societies, both in the United States and abroad.

From among his various honors, one may mention three medals from foreign geological societies and the Hayden Medal from the Academy of Natural Sciences of Philadelphia. During the years Walcott had received eight honorary LL.D. degrees, two honorary D.Sc. degrees, one honorary Ph.D., and a Doctor Honoris Causa, an even dozen of academic honors. While this is a remarkable record of recognition, one need only dig a bit beneath the surface to see just how significant were many of these awards. For example, not only did he receive an honorary Ph.D. from the university in Oslo, but this degree was granted at the 100th anniversary celebration of the university; his D.Sc. degree from Cambridge was given in connection with the celebration of the semicentennial of the publication of Darwin's *Origin of Species.*

Although Walcott's activities with local scientific societies began earlier in his career, it is appropriate to note them here. They were most extensive in 1899 when he led the formation of the Washington Academy of Sciences. He served as president of this organization until 1911; no succeeding president has served more than one year. He found the time in 1898 to

be president of the Cosmos Club. Other offices in local and national organizations are too numerous to list readily.

Through his closing years Walcott continued to be an active worker, and it is interesting to note that the manuscript for only one posthumous paper was left. All of his other work was published; his investigations were summarized as he proceeded. It has been remarked that perhaps his most outstanding accomplishment was the model of devotion to science and duty which he maintained for his younger colleagues to follow.

In spite of this enviable record, however, there was a serious cloud on the horizon. This concerned the finances of the Smithsonian Institution, an organization with which Walcott had been identified for more than half a century. The Smithsonian, a privately endowed institution, was in financial straits. The distinction is not clear to the general public, but the Smithsonian receives Federal funds only for certain services, specifically the administration of several small agencies such as the U.S. National Museum. Because of the temper of the times, best illustrated by the establishment of a Bureau of the Budget whose activities replaced the direct reports formerly made to Congressional committees by the heads of various agencies, the Smithsonian was inadequately funded and the agencies it administered also suffered.

Although several younger members of the museum staff attributed the lack of money to the Secretary's spending much of the Smithsonian's funds on field work in Canada, this was simply not true. Most of the field work was financed, at least in the later years, directly by the Walcotts. Walcott, with George Otis Smith, his successor as Director of the Geological Survey, had constructed four major apartment houses in the Washington area and his wife was independently wealthy. The point is that there was no Smithsonian income available to be spent in such investigations.

Walcott recognized the need for funds and at the age of

seventy-five took steps to repair it. He proposed a meeting of the Smithsonian Establishment. This legal organization is superior to the Board of Regents, and Walcott felt by calling it that he could obtain the necessary backing for a major fund drive throughout the United States. Plans proceeded smoothly throughout the latter part of 1926, but early in February 1927 C. D. Walcott suffered an apoplectic stroke while attending a local scientific meeting. He lingered for a few days at home but died on February 9, 1927. It was only because of his deathbed insistence that the Establishment of the Smithsonian met as planned on February 11, 1927, to institute his plans for a national fund-raising campaign. This campaign had only limited success, unfortunately. Had Walcott lived and more funds been obtained, the course of the Institution for many years in the future would have been changed.

Formal memorial services for Walcott were held by the Smithsonian eleven months after his death. Many memorials were written in various scientific journals and a large number of educational institutions in the Pacific Northwest held memorial services on the occasion of his seventy-seventh birthday.

In 1922 the Charles D. and Mary Vaux Walcott Fund was listed in the financial statement of the Smithsonian Institution with assets of $11,520. No details are given as to its establishment, but it was clearly a gift from the Walcotts as a "research fund for development of geological and paleontological studies and publishing results thereof." Upon Mrs. Walcott's death in 1940, nearly $400,000 from her estate was added to this fund. The income of the fund has been put to good use in advancing Walcott's field of study, and the fund is truly a living memorial to this man.

SUMMARY

Walcott's outstanding administrative work needs no further comment but a summation of his scientific accomplishments is

in order. His bound, published scientific works occupy nearly three feet of bookshelf. In terms of sheer volume he definitely was one of the most productive paleontological writers in America. One contemporary paleontologist estimated that at the time of Walcott's death he had contributed 70 percent of all the published information on the pre-Cambrian and Cambrian of North America; half of this was written during his years with the Smithsonian.

When one considers the state of the knowledge of the primordial terrain in America at the time Walcott first began his study, the field conditions under which he worked, and the area that he covered, the results are simply astounding. His work has been, if not criticized, at least negated by some subsequent workers as being more or less compilation; this is far too harsh an indictment. In so far as generalizations may be made about his published work, specimens are well prepared, fossil illustrations are fine, descriptions are clear, and species names closely follow the practices of nomenclature prevailing during his lifetime.

Walcott's Cambrian work is basic—no other term applies. It must be noted that, by its very nature, paleontology is an additive field, perhaps more so than almost any other major discipline of science. It is always subject to continuous revision as new collections and scientific personnel permit. That the observed range of some fossils has been modified, that new genera have been named, and that new stratigraphic formations have been defined in no way detracts from Walcott's pioneer accomplishments.

Walcott is not generally considered to have had a profound influence on geologic thought, as distinguished from paleontological studies. Nevertheless, his 1894 address on geologic time is a significant summary of the then current opinions. Had radioactive dating of rocks not been discovered, today

this paper might have been required reading for every graduate student.

If Walcott did not deal particularly with suprageneric classifications of the trilobites, this was partly because the necessary basic data on species and genera had not yet been accumulated. Indeed, there is still no commonly accepted ordinal classification of the trilobites, in spite of the fact that they are a group in which the inherent interest of the layman, the collector, and the paleontologist is second only to that concerning the dinosaurs. Nevertheless, Walcott did major work on the systematic position of the trilobites within the arthropods. His earlier work on arthropod limbs and his 1921 paper on arthropod appendages are truly classics. Of the several conflicting opinions of his time regarding the interpretations of the trilobite limbs, it is now generally agreed that his was the more correct view.

Although paleontology is not the sort of science that is subject to breakthroughs, as the term is now understood with regard to the physical sciences, Walcott's discovery of the Burgess shale fauna certainly must rate as a major paleontological accomplishment. His preliminary descriptions of the fauna are adequate; they, of course, are subject to considerable restudy. It is unfortunate that the press of circumstances did not permit him to spend more time on the broader biological implications of this treasure trove. One should always bear in mind that were it not for the hard, physical labor of quarrying performed by a man in his sixties, the unique Burgess shale fauna would never have been made available for study by biologists and paleontologists.

Perhaps the finest words of tribute to Walcott were paid by his long-time friend and fellow geologist, Whitman Cross. To W. C. Broeger, a mutual friend and an eminent Norwegian geologist, Cross wrote, "His own work is, of course, far from

finished. It would have been so, no matter how long he had lived. How can a great research, with ever-growing material and new developments, be completed? But assistants will be able to prepare much more of the results for publication.

"I have never known a man whose life was so dominantly one of intellectual work, with real recreation playing so small a part. *He did not know how to play!* He saw so many things to do and had so many opportunities which he could not refuse to accept.

"It is quite remarkable to see a man with no college education—the lack of which was at times evident—rise to the head of a learned profession and receive the highest academic honors from universities and societies the world over. His ability and accomplishments could not be passed over."

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KEY TO ABBREVIATIONS

Am. J. Sci. = American Journal of Science
Ann. Lyc. Nat. Hist. N.Y. = Annals of the Lyceum of Natural History of New York
Ann. Rept. N.Y. State Mus. Nat. Hist. = Annual Report of the New York State Museum of Natural History
Bull. Geol. Soc. Am. = Bulletin of the Geological Society of America
Cambrian Geol. and Paleont. = Cambrian Geology and Paleontology (a title of convenience used for five volumes of Walcott's papers in Smithsonian Miscellaneous Collections)
Cincinnati Quart. J. Sci. = Cincinnati Quarterly Journal of Science
Congr. Geol. Internat., Compt. Rend. = Congrès Géologique International, Comptes Rendus
J. Geol. = Journal of Geology
Nat. Geogr. Mag. = National Geographic Magazine
Neues Jahrb. Mineral. = Neues Jahrbach für Mineralogie
Pop. Sci. Monthly = Popular Science Monthly
Proc. Am. Assoc. Advan. Sci. = Proceedings of the American Association for the Advancement of Science
Proc. Biol. Soc. Wash. = Proceedings of the Biological Society of Washington
Proc. Nat. Acad. Sci. = Proceedings of the National Academy of Sciences
Proc. U.S. Nat. Mus. = Proceedings of the United States National Museum
Proc. Wash. Acad. Sci. = Proceedings of the Washington Academy of Sciences
Rept. U.S. Nat. Mus. = Report of the United States National Museum
Smith. Inst., Ann. Rept. = Smithsonian Institution Annual Report
Smith. Inst., Spec. Publ. = Smithsonian Institution Special Publication
Smith. Misc. Coll. = Smithsonian Miscellaneous Collections

Trans. Albany Inst. = Transactions of the Albany Institute
Trans. Am. Inst. Mining Engr. = Transactions of the American Institute of Mining Engineers
U.S. Geol. Surv. Ann. Rept. = United States Geological Survey Annual Report
U.S. Geol. Surv. Bull. = United States Geological Survey Bulletin
U.S. Geol. Surv. Monogr. = United States Geological Survey Monograph
U.S. Senate Ex. Doc. = United States Senate Executive Document

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