

## MEMORIAL OF HENRY STEPHENS WASHINGTON

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Henry S. Washington, distinguished leader in the chemistry, mineralogy, and petrology of the igneous rocks, and in 1924 President of the Mineralogical Society of America, died in Washington, D.C. on January 7, 1934, within eight days of his sixty-seventh birthday. He has been justly called one of the most eminent and picturesque personalities in American science.



HENRY STEPHENS WASHINGTON  
1867-1934

A descendant in collateral line from the family of George Washington, he was born in Newark, New Jersey, on January 15, 1867, the son of George and Eleanor Stephens Washington. Schooled in the classics at Yale University, where he received the degree of A.B. in 1886 and A.M. in 1888, he pursued graduate work in physics and chemistry at Yale, in geology and petrology at Leipzig, and in archeology at the American School of Classical Studies at Athens. He received the degree of Ph.D. at Leipzig in 1893, the subject of his inaugural dissertation being a study of the volcanoes of the Kula Basin in Lydia. During two of these earlier years he was assistant in physics at Yale.

During a part of each winter and spring for the six years, 1888-1894, Washington was engaged in archeological studies at Athens. He participated in a considerable number of excavations in various parts of Greece and made material contributions toward their expenses, and in some cases assumed the whole cost himself. Concerning one of these the Director of the school reported:

It was decided . . . to begin excavations at once, especially as Mr. Washington was ready to take charge of the work and generously provide *the* money.

In another annual report the Director refers to Washington as follows:

Owing to the experience which for several years past he has acquired in such work, as well as to his enthusiasm and unselfish devotion, his services were such that I can hardly realize how the undertaking could have been carried out as it has been done without his cooperation.

His knowledge of geology was of peculiar assistance in these excavations, but he quickly developed, competence also in the more strictly archeologic technic. In all of these labors he achieved results of permanent value. These are set forth in a series of contributions to the *American Journal of Archeology* from 1890 to 1898. It is notable but not surprising to find that his investigation of the date of the Santonin vases showed a lively interest in volcanic activity; that he contributed a chapter on the geology of the region to the final report on the Argive Heraeum; and that he identified the sources of the marbles used in Greek sculpture. Archeology was in the ascendancy, but geology was firmly established.

Washington's return to Yale in 1895 as instructor in mineralogy marks the end of the "archeological period," but the subject held a lifelong place in his affections. It was a part of the equipment of a keen and amazingly versatile mind. In later years he found peculiar pleasure in the investigation of worked jade and obsidian artifacts from Mexico and Central America. Nevertheless, he had turned definitely now to that field in the earth sciences that claimed his devotion for nearly forty years of fruitful toil.

Teaching did not appeal to Washington as a life work. He was eager to give himself wholly to his research; so in 1896, being financially independent, he established a private laboratory at his home in New Jersey and began that intensive study of the igneous rocks and minerals which he pursued until the end. It was a program of endless toil and to a less zealous spirit much of it would

have seemed drudgery. Thoroughness and the utmost in accuracy were fundamental with him; the life of the dilettante offered no temptation. Even as a young man financial resources meant only the opportunity for thoroughgoing investigation *in* his chosen field. When reverses came he grudgingly gave part of his time to consulting work as a mining geologist, and in this connection he maintained an office in New York from 1906 to 1912. The writer's association with him during this trying period is a treasured memory. In 1912 he returned wholly to his research with the transfer of his labors to the Geophysical Laboratory of the Carnegie Institution of Washington, where he remained continuously, except for the war years 1918 and 1919, when he served as chemical associate and scientific attache at the American Embassy in Rome.

In this place it is of peculiar interest to note that his first papers, as a young man just out of college, were contributions to mineralogy, with W. E. Hidden in 1887 and with W. F. Hillebrand in 1888. This persistent thread of interest was again taken up in 1896, with direct contributions to mineralogy, and these continued in a long series through the years, many of the later papers having been prepared in collaboration with his colleagues at the Geophysical Laboratory. Early petrographic papers also followed the lines of abiding interest. They were concerned with the study of rock analyses, petrographic provinces, and the genetic classification of igneous rocks.

In the chemical relations of the igneous rocks and in their broader petrologic aspects Washington was an outstanding authority. *In* the advocacy of thoroughness in this field he became also a leader *in* the demand for higher standards of accuracy and completeness in chemical analyses. His *Manual of the Chemical Analysis of Rocks* (1st ed. 1904, 4th ed, 1930) has been the standard textbook in its field for thirty years. Although written primarily for the unpracticed student, this book is known to chemists in the inorganic field everywhere, and it has contributed much in a constructive way toward raising the standard of precision in rock analysis.

Washington's surpassing interest in igneous rocks and his amazing capacity for painstaking toil are attested by his collections of the chemical analyses of rocks, with critical discussion of the character and use of analyses—all ranked according to quality calculated into "normative minerals," and classified according to the quantitative system developed by him in collaboration with

Dr. Whitman Cross, Professor J. P. Iddings, and Professor L. V. Pirsson. These collections, published in Professional Papers 14, 28, and 99 of the United States Geological Survey, are also land-marks in the transformation of descriptive petrography into the science of petrology. Professional Paper 99 is a quarto volume of 1201 pages. "It is known to every geologist in the world. To those of Washington's acquaintances unfamiliar with the more earnest side of his character the amount of patient investigation and even drudgery to which he was willing to devote himself in this work is almost unbelievable."<sup>1</sup>

The Quantitative Classification of Igneous Rocks may not have solved that difficult problem in its entirety, but it stimulated the interest of petrographers and geologists everywhere in the chemical and mineral constitution of these rocks and in the effort to devise a practical scientific method of classification. This interest has been reflected in part in the several alternative systems that have been proposed. Complacent acquiescence in the old condition of chaos in this field has been definitely brought to an end.

Research in the igneous rocks led naturally in the later years to their broader connotations in the distribution and correlation of the chemical elements in these rocks and *in* the radial distribution of these elements in the earth. In a similar manner the horizon broadened from the earlier conception of petrographic provinces into comagmatic regions, the rock suites of the Pacific and Atlantic basins, and the constitution of the earth, meteorites, and the sun's atmosphere.

Washington's extensive bibliography is dominantly petrographic and petrologic, rather than mineralogic; nevertheless it contains many papers on mineralogical subjects, in which his interest was chiefly in their chemical rather than their optical or crystallographic properties.

As a member of the committee on nomenclature of the Mineralogical Society of America he contributed much to the accuracy and usefulness of its recommendations, and from his extensive knowledge of languages pointed out the correct etymology and consequent proper pronunciation of many of the mineral names.

His presidential address before the Mineralogical Society at the Ithaca meeting dealt with the modern study of minerals. He combated the idea that mineralogy is a "fertiges Wissenschaft"

<sup>1</sup>Fenner, C. N. Science; n.s., vol. 79, p. 47, Jan. 19, 1934.

and emphasized the broader conception in which a knowledge of the constitution of minerals is sought, and of how they are formed, their relations to each other, to their conditions of formation, and to the earth. In furtherance of these aims he urged careful accurate work, preferably by specialists in each field, on identical homogeneous material, so that all crystallographic, optical, chemical, physical, and *x*-ray data may be accurately correlated.

The thoroughness and permanent value of his work have been recognized throughout the scientific world, and this recognition has been reflected in the official positions and the honorary memberships to which he has been elected in many countries. He was a member of the National Academy of Sciences; the Geological Society of America (vice-president 1922); the Mineralogical Society of America (president 1924); the American Chemical Society; American Philosophical Society; Archeological Institute of America; American Geophysical Union (chairman 1926-1929); International Geophysical Union (vice-president 1922); Washington Academy of Sciences; Geological Society of Washington. He was decorated Cavalier of the Order of the Crown of Italy; elected foreign correspondent, Geological Society of London; honorary member, Mineralogical Society (England); Academic Sci. de France; foreign correspondent, Sociedad Espanola de Historia Natural; foreign member, Accademia dei Lincei; Societa Geologica Italiana; Societa Zelanti (Aci Reale, Secily); Academy of Science Norway; Academy of Science Modena; Academy of Science Turin.

In the course of his investigations Washington traveled widely in Greece, Asia Minor, Italy, Spain, Brazil, the Hawaiian Islands, and the United States. He possessed an amazing facility in languages, which he acquired with little apparent effort wherever he went. Thus to his knowledge of classical Greek and Latin he readily added German, French, Italian, Spanish, Portuguese, modern Greek, and even Arabic and Turkish.

Washington's magnetic personality was enriched by his brilliant intellect, his broad culture, and his genuine interest *in* and knowledge of an astonishing range of topics, not only in the physical and natural sciences, but in literature, history, music, art, archeology, ethnology and philology. Following the intense seriousness of his research and his writing he found relaxation in the lighter mood, and his lively wit and keen sense of humor were a constant source of delight to those who had the privilege of knowing him.

"Washington took much delight in associating with congenial friends and was one of the most, active members of the Cosmos Club of Washington. In more public assemblages his features and bearing were of a character to make him an outstanding figure. His was a many-sided and exceptional personality, in many ways almost unique. His contributions to science are of lasting value,"<sup>2</sup>

<sup>2</sup> Fenner, C. N., *loc. cit.*, p. 48.