tertiary butyl groups on the same carbon. To form these, a positive tertiary butyl group would have to add to 2, 4, 4-trimethylpentene-2. No product of this kind has been found to date in our studies, although we have carefully fractionated 150 gallons of crude triisobutylene through the very efficient semi-commercial columns of Dr. M. R. Fenske and his colleagues. Apparently a positive tertiary butyl group will not add to an olefinic carbon which already has a tertiary butyl group attached to it.

Extended studies are being conducted on more complicated cases of the polymerization of olefins. The present theory of the mechanism of this process is proving very useful in these experimental studies.

OBITUARY

HENRY STEPHENS WASHINGTON

AFTER a long illness, Henry Stephens Washington, one of the most eminent and picturesque personalities in American science, died at his home in Washington, D. C., on January 7, 1934.

Washington was born in Newark, New Jersey, on January 15, 1867, the son of George and Eleanor Stephens Washington. After receiving from Yale University the degree of A.B. in 1886 and A.M. in 1888, he continued postgraduate studies at Yale, Leipzig and the American School of Classical Studies at Athens.

Always intensely interested in many intellectual fields, he spent a number of the earlier years of his career in archeological excavations in Greece, and later was assistant for several years in physics and mineralogy at Yale. Though in his later life he did not participate actively in archeological research, he retained his love for the subject, and was a fellow of the Archeological Institute of America. Without being a specialist, he possessed a remarkable store of knowledge regarding ancient peoples, their origins and mode of life, and their monuments, inscriptions and art. He was widely read, had a very retentive memory, and there were few topics on which he was not able to converse with much more than superficial knowledge. His familiarity extended to such varied subjects as botany, philology, literature, the development of social customs and culinary art.

The scientific field to which he devoted the greater part of his life and in which he became recognized as an eminent authority was that of geology and mineralogy; chiefly, but not wholly, were his interests directed toward the aspects of these subjects to which his skill as an analytical chemist contributed. He and Dr. W. F. Hillebrand, working independently but toward the same end, recognized and insisted upon the value of exact determinations of rock constituents, at a period when many published analyses left much to be desired. Largely as a result of their labors the general standard of excellence of rock analyses has become, in later years, of a very different order than formerly. Washington's treatise, "The Chemical Analysis of Rocks," has passed through several editions and has been a standard text-book everywhere for nearly a generation. It embodies not only tested methods of analytical procedure but gives instructions regarding details of manipulation that are most important. As a further contribution toward the ideal he had in mind, a number of years ago he set himself the prodigious task of assembling from the literature all rock analyses that seemed worthy of attention, and calculated the results in terms of "normative minerals." From his familiarity with the subject he was able to group the analyses into superior and inferior and to point out in what respect the latter were defective. A second and enlarged edition of this monumental work, published by the U. S. Geological Survey in 1917, is a quarto volume of 1,201 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.

This work further embodied a classification of igneous rocks by chemical composition according to a quantitative scheme devised by Washington in collaboration with Dr. Cross and Professors Iddings and Pirsson. Though this system now has rivals in somewhat similar schemes devised by others, it probably represents the first serious attempt at classification in this manner.

Petrological and volcanological investigations carried Washington on extensive travels in Greece, Asia Minor, Italy, Hawaii, Brazil and the United States, and many valuable publications resulted. He was gifted with exceptional linguistic aptitude and became proficient in the conversational use of a number of European languages, and even acquired a knowledge of Arabic.

From 1906 to 1912 he was engaged in professional work as a mining geologist. In 1912 he became a member of the staff of the Geophysical Laboratory of the Carnegie Institution of Washington. Here he remained until his death, except for a period during the war years, when he served as chemical associate and scientific attaché at the American Embassy in Rome. During his association with the Geophysical Laboratory he was enabled to pursue his investiga-

tions in the field and supplement them with laboratory studies, and prolific results followed. In the city of Washington the side of his nature that enjoyed the stimulus of personal contact and association with a multitude of friends found a congenial environment.

In addition to the subjects of investigation noted, mention should be made of his studies of volcanological phenomena, petrographic provinces, characteristic associations of elements in rocks, Hawaiian lavas, the occurrence of diamonds in Arkansas and Brazil, the composition of pyroxenes and amphiboles, fumarolic deposits, sources of potash, isostasy and the constitution of the earth as a whole.

He was happy in the recognition accorded his work by fellow workers at home and abroad, as indicated by official positions and honorary memberships to which he was elected. He was a member of the National Academy of Sciences; the Geological Society of America (vice-president, 1922); Mineralogical Society (president, 1924); American Philosophical Society; American Geophysical Union (chairman, 1926–1929); International Geophysical Union (vice-president, 1922); Washington Academy of Sciences; Cavalier, Order of the Crown, Italy; foreign correspondent, Geological Society of London; honorary member, Mineralogical Society (of England); Academie de France; foreign correspondent, Sociedad Española de Historia Natural; foreign member, Accademia dei Lincei; Societa Geologica Italiana; Modena Academy; Norway Academy and Turin Academy.

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.

C. N. F.

HOWARD CROSBY WARREN

THE news of Professor Warren's death on January 4 sent a wave of grief and shock through the older generations of contemporary American psychologists such as could have been caused by few other losses. Only eight days before, his friends had rejoiced to see him at the dinner in honor of Dr. Cattell, with his eyesight restored by an operation and his health and spirits apparently at their best.

His life was, in addition to its intellectual achievements, the triumph of an ideal temperament over the effects of disaster at the outset. Born on June 12, 1867, in Montclair, New Jersey, the son of a rich man, at eighteen months he was so burned by a lamp that during the first five years of childhood he suffered operation after operation, and he carried through life deep facial scars and a useless hand and eye. Yet in his autobiography he could say that his early life was "the story of a happy childhood, a pleasant home life and congenial playmates"; and write of his "uniform good-fortune after adolescence," when a more egocentric person would have gone with a heavily scarred temperament all his days.

Shortly after he was graduated from Princeton in 1889 he was appointed instructor in philosophy under President McCosh and Professor Ormond. In 1891 began a two years' sojourn at Leipzig, Berlin and Munich. He then became J. Mark Baldwin's assistant in the new Princeton laboratory. Three years later he was made assistant professor, and in 1902 succeeded Baldwin as professor of experimental psychology. He married Catharine Campbell in 1905. From 1914 to his death he was Stuart professor of psychology, although after 1920 he taught only in the first semester. He was president of the American Psychological Association in 1913.

A considerable part of his professional life was devoted to the interests of psychological journals. This career began in 1894, when he undertook with Livingston Farrand the compilation of *The Psychological Index,* an annual register of psychological literature in connection with *The Psychological Review.* In 1903–04 he became joint owner with Professor Baldwin of the *Review* journals, and added to them *The Psychological Bulletin,* with himself as editor: he bought Baldwin's interest in 1910. The American Psychological Association completed its purchase of the journals in 1928 when Professor Warren cancelled the last third of the price which the association had agreed to pay for them. The type of interest on his part indicated by these activities, that of creating intellectual tools for his science, reached its culmination in the task which with many collaborators he has left practically completed: the compilation of an exhaustive "Dictionary of Psychology and Cognate Sciences."

He had a mind of fine clarity and balance. These qualities appear in his books ("Human Psychology," 1919, enlarged edition 1920, revised edition with L. Carmichael, 1930; "A History of the Associational Psychology," 1921); they appear also in his opinions. He was a mechanist, rejecting the haziness of vitalism. He accepted as valuable both objective and introspective methods, including the configurational type of introspection.

Above all, he was a man of directness and vigor, a spirited opponent but never an enemy, and a friend who met his friends always with warm interest and good cheer.

MARGARET FLOY WASHBURN