

ARNOLD HAGUE.

ARNOLD HAGUE, the able geologist and a man of rare personal gifts, was born in Boston December 3, 1840, and died at his home in Washington May 14, 1917. The immediate cause of his death was cerebral hemorrhage and was undoubtedly hastened by his recent fall in Albany while attending a meeting of the Geological Society of America. For nearly fifty years he was prominent in the geological affairs of the country. His parents, the Rev. Dr. William Hague, a noted clergyman and writer, and Mary Bowditch (Moriarty) Hague, lived in Boston during his youth. There his education began but later he attended the Albany Academy.

James D. Hague, his elder brother, studied mining engineering at the Lawrence Scientific School of Harvard, and Arnold may have acquired from him his taste for geology. At the Sheffield Scientific School of Yale where Arnold Hague graduated (Ph.B.) in 1863 he met as classmate Clarence King, who had much to do with his career. Three years in succession Hague studied in Europe at the Universities of Göttingen and Heidelberg, and the Freiberg School of Mines. While in Bunsen's laboratory he devoted himself chiefly to chemistry and mineralogy. The spring of 1865 found him in Freiberg, where he met S. F. Emmons. They were especially congenial, and with the same bent they soon became and continued through life devoted friends and colleagues. Hague in his excellent memoir of Emmons tells much of himself. Indeed, much of that loving tribute to his friend reads like an autobiography. He writes "I was always ready to lay aside metallurgical studies for field geology. Together we took all the week-end excursions with dear old Bernhard von Cotta, visiting many parts of Saxony and studying petrology as laid down in that now antiquated text-book, Cotta's 'Die Gesteinlehre' (Zweite Auflage, 1862). Many an evening Emmons and I spent together over the map of Saxony, acquiring our initiative experience in geological cartography which later stood us in good service. Both came to realize the influence of Cotta upon our future careers, as he gave us much of his time. In this way, during these few months of German student life, was formed a friendship that always endured."

Hague returned to his home in Boston in December, 1866, and soon received from his friend, Clarence King, an offer to join in the Geological Exploration of the 40th Parallel which King was just succeeding in carrying through Congress without the customary delay. Hague lost no time in bringing Emmons to the attention of King, who secured him, at first as

a volunteer, for the 40th Parallel Survey. Work began on the Pacific Coast in 1867, and the party went thither by way of Panama. The only other available route was by Wells, Fargo and Company's overland stage, a tedious not to say dangerous, journey.

Hague and Emmons had separate parties in the field, and King with his own camping outfit and greater freedom of motion conducted special investigations over the whole region, all parties meeting frequently for conference. The topographic and geologic surveys of a belt 100 miles in width along the proposed route of the Central and Union Pacific Railroad proceeded together from the Humboldt country of western Nevada to the Great Plains east of the Rockies. Field work was finally completed late in the autumn of 1872, but it should be borne in mind that finished topographic maps on which the areal geology was to be shown, as Hague remarks, were seldom in the hands of the geologists till a year after completing the field work.

After the completion of the field work the final preparation of the report with its accompanying atlas was accomplished in New York, where Mr. King and his two colleagues worked together and lived in ties of closest friendship.

Hague's first scientific publications, "Chemistry of the Washoe Process" and the "Geology of the White Pine District," occurred in 1870 when he was 30 years of age. They grew out of his 40th Parallel work and appeared in Volume III of that organization. The great work, *Descriptive Geology*, of which Hague and Emmons were joint authors, appeared as Volume II, in 1877. King published *Systematic Geology*, Vol. I, in 1878.

For a comparative study, the 40th Parallel geologists in 1870 visited the Cascade Range. King climbed Mt. Shasta, Hague climbed Mt. Hood and Emmons Mt. Rainier. They observed about these lofty volcanoes the first active glaciers noted in the United States, and, using the lavas collected, Hague and Iddings made a comparative study of the volcanic rocks of the Cascade Range and the Great Basin.

In 1877 Hague received the appointment as government geologist of Guatemala and traveled extensively over the republic visiting mines and active volcanic centers. The following year he was engaged by the Chinese government to examine gold, silver, and lead mines in Northern China.

Congress created the bureau of the U. S. Geological Survey in 1879, thus withdrawing Congressional authorization from existing surveys and exploration parties and accomplishing a complete reorganization. Clarence King was appointed the first director, and took the oath of office May 24. Arnold

Hague, who had returned to the United States, was appointed a geologist in the U. S. Geological Survey July 8, 1879, but did not take the oath of office until April 19 of the following year.

Under the new organization he was sent to Nevada to study the geology of the Eureka district. His report, published in 1893, is Monograph 22 of the U. S. Geological Survey. In 1883 he was made geologist of the Yellowstone National Park. With the aid of a number of able assistants and specialists the general study of the Yellowstone National Park was completed some years ago and the results published as Monograph 32, part 2, leaving part 1 to be prepared as a final report by Mr. Hague. It is to include a special study of the geysers which engaged his attention for a number of years. This work, his last and greatest, Hague leaves practically complete.

Mr. Hague in addition to his larger reports has contributed papers to a number of scientific periodicals, especially to this Journal. Among these may be mentioned the "Early Tertiary Volcanoes of the Absaroka Range," delivered as his presidential address before the Geological Society of Washington and "The origin of the thermal waters in the Yellowstone National Park," his presidential address before the Geological Society of America. His bibliography of scientific papers includes 39 titles, the last of which is the memoir to his lifelong and devoted friend, S. F. Emmons, published in 1913 by the National Academy of Sciences.

Hague was a fellow of the Geological Society of America of which he was president in 1910, of the Geological Society of London, and a member of numerous other scientific societies. In 1885 he was elected to the National Academy of Sciences, of which he was an active member and officer. As a member of the Commission appointed at the request of the U. S. Government by the National Academy of Sciences, he had much to do with the plan for our National Forest reserves.

Columbia University honored him with the degree Sc.D. in 1901, and in 1906 he received the degree of LL.D. of the University of Aberdeen. He was vice-president of the International Geological Congress at Paris 1900, Stockholm 1910, and Toronto 1913. Nov. 14, 1893, he married Mary Bruce Howe, of New York.

Mr. Hague was not a ready writer nor voluminous, but exact. He aimed more to write well and truly than much. He was a charming host, and there are but few scientific men in America who have had so wide a circle of devoted friends as Arnold Hague.

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