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ARTHUR KEITH

*1864—1944*

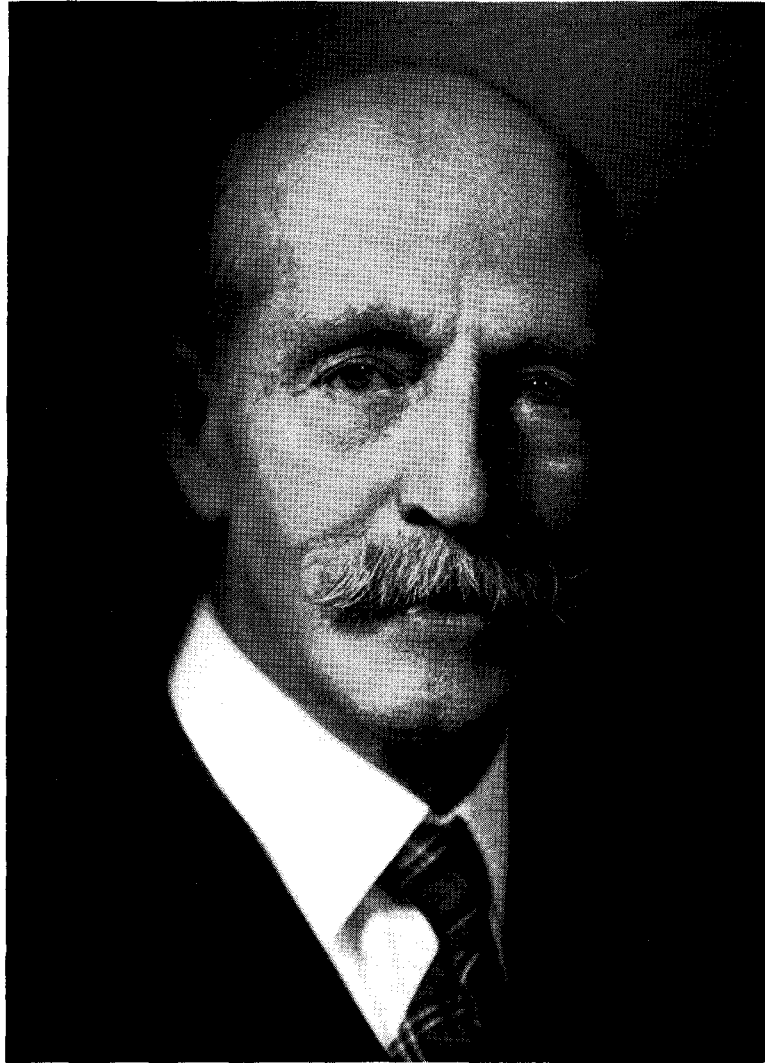
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*A Biographical Memoir by*  
CHESTER R. LONGWELL

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*Biographical Memoir*

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*Arthur Keith*

## ARTHUR KEITH

1864-1944

BY CHESTER R. LONGWELL

THE NAME of Arthur Keith is inseparably connected with Appalachian geology. During most of his mature life, over a period of nearly 50 years, his chief efforts were devoted to field study, mapping, and written description of selected areas distributed from the Carolinas to Maine. Sixteen folios of the United States Geological Survey, most of them under his name alone, a few prepared jointly with other workers, are in themselves a monument to his skill and industry.

Keith's ancestors came from England to Massachusetts Colony in the seventeenth century. His father, Harrison Alonzo Keith, and his mother, Mary Elizabeth Richardson, grew up in Ohio and were in the same class (1859) at Antioch College during the presidency of Horace Mann. After their marriage they settled in St. Louis, Missouri, where Arthur was born on September 30, 1864. While he was still an infant the family moved to ancestral Massachusetts and set up a new home in Quincy. There the father was high school principal for twenty years, later Mayor, and finally served as City Clerk until his death.

Arthur attended public school in Quincy until the age of 12, when he went to Adams Academy to prepare for college. He entered Harvard in 1881 and received his bachelor's degree in 1885. During his preparatory and college years he was keenly interested in outdoor sports. Quincy is near the shore of Boston Bay, and he became an

enthusiastic yachtsman, not only in operating but also in designing and helping build racing vessels. At Harvard he rowed in the varsity crew, was a letter man in football, and became heavyweight wrestling champion. These athletic activities hardened and trained his naturally rugged physique, and helped prepare him for the strenuous field work in which he was engaged well beyond his seventieth year.

Like many others in his generation at Harvard, Keith sat under Nathaniel Southgate Shaler and was fascinated by that master's eloquence in presenting the fundamentals of geology. But not until his graduation did Keith give serious thought to a career, and he then went to Shaler for counsel. Largely as a result of Shaler's advice he decided to be a geologist. To prepare himself he spent a year in the Lawrence Scientific School, and the following year in graduate study at Harvard. He was awarded the A.M. degree, and elected to go directly into geologic work, first with the Massachusetts Topographic Survey. In June, 1887, he became assistant in a field party of the United States Geological Survey, and spent the summer mapping in the mountains of eastern Tennessee. That experience determined the pattern of his later life. He went to Washington at the end of the field season, and became a regular member of the Federal Survey, which was still in the first decade of its vigorous early growth. The Geological Society of America was founded a year after Keith went to Washington, and he was elected to membership in 1889.

When Keith began his career with the Geological Survey, J. W. Powell was Director and G. K. Gilbert was Chief Geologist. Bailey Willis was in charge of field studies in the Appalachian Division, and Keith was assigned as field assistant to Willis in Tennessee. Work on the Geologic Atlas of the United States was in vigorous progress, and Keith soon graduated from assistant to do independent work on quadrangle maps. The standard scale of the base maps used in his work was 1:125,000, with contour interval 100 feet. At the time these dimensions were considered adequate for geologic map-

ping in detail, and in truth they marked a great advance over the maps available to the able James M. Safford a quarter of a century earlier. For several decades Keith's geologic folios in the Southern Appalachians were accepted as models, and three contiguous sheets—the Mount Mitchell, Roan Mountain, and Bristol<sup>1</sup> quadrangles—were widely used as the most satisfactory geologic cross section of the Appalachian belt. His maps published between 1891 and 1907 represent detailed study and description of nearly 15,000 square miles, largely in areas with intricate bedrock structure.

For nearly 20 years Keith spent his summers contentedly in strenuous field work, his winters in writing; and his high productivity continued unbroken. But at last he consented to take part in administration, and in 1906 he became chief of the Section of Areal Geology for the entire country. This assignment soon became too demanding for one man, and in 1913 a division was made into Eastern and Western Areas, with Keith in charge of the former. Although the supervisory work brought an immediate halt in publications under his name, he still spent much of each summer in the field to direct the mapping by younger men; and his long experience in preparing folios was turned to good account through his help in planning and his critical reading of other men's reports. Several who were under his direction have testified to his high standards, manifested in severe criticism which however was wholly constructive.

During the First World War he began, at the request of the United States Army, a special study of features with possible military importance in Maine, New Hampshire, and Vermont. This work gave him a welcome diversion from the official cares of Washington and aroused in him a strong interest in the bedrock structure of the Northern Appalachians, which he saw had much in common with the major structural features he had mapped from Virginia southward. After the war his available time for field work was spent in New England, and in 1924 he withdrew from administra-

<sup>1</sup> This folio by M. R. Campbell.

tion in order to give his full time to the new studies. But the mapping in the northern region was not done meticulously, one quadrangle at a time, as in his earlier program. Part of the reason was the scarcity of good base maps in northern New England, and a change of policy which gave the making of folios a minor place in the Survey's mapping program. Moreover, Keith probably wished to cover a large territory within a few years and felt that his long experience fitted him to analyze the major elements of stratigraphy and structure without the necessity of time-consuming study in detail. One product of his broad study is a geologic map of Maine, on the scale 1:1,000,000, which has been very useful. His reconnaissance work on the complex geology of northwestern Vermont is recorded in three general papers which no doubt stimulated interest leading to more careful studies, but which soon became in large part supplanted by the published results of other investigators.

In his later years Keith published few scientific papers but took active part in the official work of scientific organizations. He served as President of the Geological Society of Washington; as Councilor, Vice-President, and President (1927) of the Geological Society of America; as Chairman (1928-31) of the Division of Geology and Geography, National Research Council; as Council Member and Treasurer (1932-40) of the National Academy of Sciences. In addition to those mentioned above, the organizations of which he was a member included the American Association for the Advancement of Science, Association of American Geographers, American Association of Petroleum Geologists, Seismological Society of America, American Geophysical Union, American Institute of Mining and Metallurgical Engineers, American Academy of Arts and Sciences. In 1930 he went to Paris as a delegate of the National Academy of Sciences and the Geological Society of America, for the Centennial of the Geological Society of France. On the same journey to Europe he represented the National Academy at the meeting in Stockholm of the International Union of Geodesy and Geophysics.

For many years after his father died Keith lived with his mother.

On her death in 1916 he married Elizabeth Mary Smith of Athens, Ohio. They had no children. Mrs. Keith worked with him in preparing his publications, and often went with him into the field. She was his close companion until her death in January, 1942. After this bereavement his health failed rapidly, and after a long illness he passed away at Silver Spring, Maryland, on February 7, 1944.

Keith's interest was primarily in factual rather than theoretical aspects of geology. His greatest satisfaction was in field study. He was a keen observer, and most of his notes were in the form of neat symbols on his base maps. Those who have examined these eloquent sheets are unanimous in pronouncing them models, and in regretting that the officials of the Geological Survey did not insist on including his structure symbols on the published maps. With full details in his own mind, building up as he studied one area after another, Keith slowly conceived a synthesis of Appalachian structure and history. With characteristic reserve he kept this larger picture to himself until 1922, thirty-five years after his work with the Survey began; and even then he committed his ideas to print only on urging by Charles Schuchert that he join a symposium, sponsored by the Geological Society of America, on the structure and history of mountain belts and the causes for their development. Keith's contribution gives a valuable over-all picture of the Appalachians, and presents a speculation that deformation of the geosynclinal belt was caused by pressure from the Atlantic floor against the continental margin, with intrusion of igneous masses playing an important part. In his presidential address to the Geological Society of America in 1927 this general thesis was extended to the structural history of all North America. In that address he gave critical attention also to the hypothesis of continental drift, interest in which was at that time strong because an English translation of Wegener's book had appeared a short time before.

Keith's concept of igneous intrusion as a primary cause of orogeny has not met with much favor. Parts of his interpretation of struc-

ture in the Northern Appalachians have not stood the test of growing evidence from later field studies. But by general agreement he has high rank in the list of those who have made enduring contributions to our knowledge of Appalachian geology.<sup>2</sup>

<sup>2</sup> I am indebted to Esper S. Larsen, Jr., for some of the factual data required for this brief essay.



## KEY TO ABBREVIATIONS

- Am. Geol. = American Geologist  
Am. J. Sci. = American Journal of Science  
Ann. Rep. = Annual Report  
Bull. Geol. Soc. Am. = Bulletin, Geological Society of America  
Div. Geol. & Geog., Nat. Res. Coun. = Division of Geology and Geography, National Research Council  
Geol. Atlas = Geologic Atlas  
Geol. Survey = Geological Survey  
Int. Geol. Cong. = International Geological Congress  
J. Wash. Acad. Sci. = Journal of the Washington Academy of Sciences  
Phil. Soc. Wash. = Philosophical Society of Washington  
Seis. Soc. Am. = Seismological Society of America  
Tech. Exp. Sta. = Technical Experiment Station  
U.S. Geol. Survey = United States Geological Survey

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