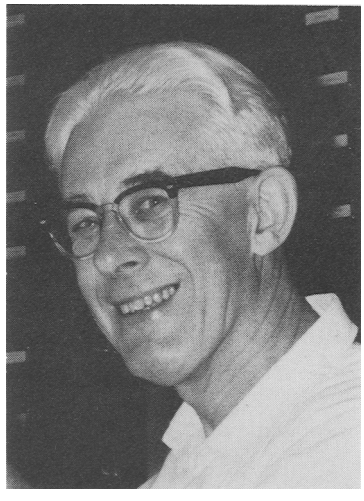
Clay Minerals (1984) **19,** 117–119

OBITUARY

GEORGE W. BRINDLEY



George W. Brindley, Emeritus Professor of Mineral Sciences at the Pennsylvania State University, died on 23 October 1983 in State College, Pennsylvania. He is survived by his wife, Catherine, a son and a daughter.

George was born on 19 June 1905, in Stoke-on-Trent, England, a son of a school teacher. He graduated with BSc (1926) and MSc (1928) degrees in Physics from the University of Manchester. His first paper, with Professor R. W. James as a co-author, was published in the *Proceedings of the Royal Society* in 1928. They worked together, in the department led by Sir Lawrence Bragg, on X-ray scattering factors. George continued to contribute significantly to the early development of X-ray diffraction while a Demonstrator and subsequently an Assistant Lecturer in the Department of Physics at the University of Leeds, which awarded him his PhD in 1933. By this time he had published no fewer than 27 papers on the calculation of atomic scattering factors, the deformation of metals, and lattice vibrations. His twin careers as a careful researcher and as an inspiring teacher were truly launched.

Meanwhile he had met Catherine Fenton, whom he married on 2 May 1931. He was promoted at Leeds, becoming eventually Reader in X-ray Physics. In 1953 he transferred to the Pennsylvania State University as Research Professor of Mineral Sciences. In 1955 he became Professor of Solid State Technology and Head of the Department of Ceramic Technology. In 1962 he became Professor of Mineral Sciences until his 'retirement' in 1973. He was one of the founders of the renowned Materials Research Laboratory at Penn State. His research activities and involvement with learned societies continued until within a few weeks of his death.

Although his early X-ray studies on metals were of major importance, George Brindley will be most remembered for his enormous contributions to clay mineralogy. His interest in

https://doi.org/10.1180/claymin.1984.019.1.14 Published online by Cambridge University Press

clay minerals must have been prompted by his childhood spent in the English potteries and was further stimulated by the amateur geological field work that he carried out during the Second World War. A colleague at Leeds, Professor A. L. Roberts, asked him about the difference between china clay, fireclay and halloysite, and a new era in our understanding of the crystal structures of clay minerals began. Brindley's researches on clay minerals were always firmly founded in crystallography, but it must have been a major challenge for him to switch from studying the order of metals to the disorder of layer silicates. He carried out a crystal structure analysis on kaolinite and helped to elucidate its relationship to other kandites. He extended this work to include serpentines and chlorites, and then turned his attention to the thermal reactions of kaolinite. This led to a postulated structure for metakaolin and to the proposal that the spinel phase formed from metakaolin may not simply be γ-Al_2O_3, but may contain some silicon. He became interested in topotaxy and extended his studies to many hydroxides and hydrous silicates. Independently from, but more or less simultaneously with, Professor H. F. W. Taylor he developed the theory of an inhomogeneous mechanism for these dehydroxylation processes.

These X-ray studies were complemented by kinetic studies of mineral decompositions and transformations, some related to natural weathering processes. A further extension of this work was to solid-state reactions between pure oxides and he played a major role in establishing the kinetics and mechanism of several such systems, e.g. MgO–SiO_2 and CaO–Al_2O_3. Still later, in the 1960s, his research was to develop in yet another direction when he became interested in clay–organic complexes and the possible relationship between clays and petroleum deposits. Many of the more recent of his 300 or so papers have dealt with clay–organic complexes.

His research was always carried out with meticulous attention to detail and his papers are written in a characteristic style. Their logical argument and lucidity serve as a model for others to seek to emulate. In 1970 he was awarded the Roebling Medal, the highest award of the Mineralogical Society of America, for scientific eminence as represented primarily by scientific publication of outstanding research in mineralogy.

George Brindley was not merely an excellent research scientist. He was always an ambassador for clay mineralogy, telling the world of his fascination for his subject and extolling others to help him to understand it better. He did this through his contributions to learned societies, his lectures, his books and his review articles.

Several learned societies are greatly indebted to George Brindley. Together with Dr D. M. C. MacEwan he was the moving spirit behind the creation of the Clay Minerals Group of the Mineralogical Society in January 1947. He was elected its first Chairman and served from 1947 until 1949. He played a major role in the development of *Clay Minerals Bulletin*, which was later to become *Clay Minerals*. He initiated the production of specialized monographs as part of the work of the group, and, of course, he himself edited and contributed five chapters to the first monograph, *X-ray Identification and Crystal Structures of Clay Minerals*, published by the Mineralogical Society in 1951. The third edition, co-edited by G. Brown and entitled *Crystal Structures of Clay Minerals and their X-ray Identification*, was published as recently as 1980 and ensures that future generations new to the field will come under the Brindley influence. He also served as an associate editor of *Clays and Clay Minerals* and the *American Mineralogist*.

Not content with a national society, Brindley played a major role in the foundation of CIPEA, which was the forerunner of AIPEA, in 1948. His involvement with AIPEA has been considerable, especially in the work of the Nomenclature Committee. From

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1969–1970 he was President of the Clay Minerals Society, which presented him with the Distinguished Member Award in 1973. He was an honorary member of the Ceramic Association of Brazil and of the Mineralogical Society of Great Britain, and a member of honour of the French Society of Mineralogy and Crystallography. The University of Louvain, Belgium, awarded him their Doctor of Science, honoris causa in 1979.

A somewhat different but major honour was bestowed in 1978 when Maksimovic and Bish named a nickel-rich aluminous serpentine mineral, brindleyite (*Am. Miner.* **63,** 484–489, 1978). With characteristic modesty Brindley published a paper in the same journal a year later on some nickel-containing minerals without reference to brindleyite! He continued to be active in research after his retirement and his recent publications have maintained the very high standards that he always set himself.

George Brindley was also a superb lecturer, whose enthusiasm for his subject and clarity of exposition have inspired many generations of students. In 1969 he received the Matthew J. and Anne C. Wilson Outstanding Teaching Award from the College of Earth and Mineral Sciences at Penn State for 'the unequalled excellence and long-lasting effectiveness of his teaching'. Many conferences have been enlivened by his presentations. Whether plenary review lectures or short research contributions, they were always planned with meticulous attention to the smallest detail and betrayed his fascination for the topic to be discussed.

Another facet of George Brindley's character was his interest in people from all countries. He travelled widely and his research group at Penn State was almost always a mini-United Nations. He forged particularly strong links with Dr J. Mering in Paris, Dr M. Nakahira in Tokyo and Professor J. J. Fripiat in Louvain and Orleans, but he had many other liaisons, including those in Brazil, Mexico, Korea, Germany, Italy, Spain and most parts of the British Commonwealth. He lived his life as an ambassador for goodwill and understanding between peoples of all nations.

George Brindley was proud of his relationship to James Brindley (1716–1772), who was largely responsible for the canal system of England which became a foundation of the Industrial Revolution. It is not too much to suggest that his own contributions to the revolution in our understanding of clay minerals place him in a prominent position alongside his distinguished ancestor.

J. H. SHARP

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