

STURGES ('BULL') WILLIAM BAILEY 1919–1994



S.W. ('Bull') Bailey died unexpectedly at his residence in Madison, Wisconsin, on the afternoon of November 30, 1994. Bailey was an outstanding scientist, teacher, and a wise counsellor to many colleagues and students. His scientific interests primarily involved the structural characterization of the phyllosilicates, in which he essentially outlined the details of the entire group, including the micas, serpentines and chlorites.

S.W. Bailey was born on February 11, 1919 in Waupaca, Wisconsin. In his senior year at Waupaca High School in 1936, he received his nickname 'Bull', from a buddy intent on linking him dishonourably (and 'unjustly') to two sisters named Weed via a variation of the lumber camp's 'Bull of the Woods' (i.e. 'tough doggedness'). Due to his own usage, the nickname followed him everywhere but Cambridge, where he was instead known by his middle name, Bill. His nickname was delusory; Bull was a reserved, quiet person with a physical appearance quite opposite from expectations based on the nickname alone. However, in contrast to this outward, usually quiet manner, for those who knew him well and with whom he felt comfortable, he had an earthy sense of humour that seemed almost shocking.

Bailey obtained a BA degree in geology from the University of Wisconsin in 1941, where he concomitantly received Baccalaureate high honours and election to Phi Beta Kappa. His interest in mineralogy and geology developed in his sophomore year when he took a class in geology from W.H. Twenhofel. As a junior, his advisor, A.N. Winchell, 'assigned' him to identify minerals by X-ray powder diffraction in his laboratory, and Bailey soon

realized that he wanted to become an X-ray crystallographer. Although he started his MA degree immediately upon graduating, World War II intervened, and he served in the US Navy from 1942 to 1946 as an interpreter of aerial photographs. His formal education resumed upon his return home from service. Because A.N. Winchell retired during the war and the X-ray equipment had been discarded, Bailey worked on fluid inclusions in sphalerite and calcite from the southwest Wisconsin zinc deposits for his MA thesis under the direction of R.C. Emmons, and he graduated from the University of Wisconsin in 1948. For his PhD, he initially switched to economic geology, but asked his advisor, E.N. Cameron, if the Department was planning the purchase of an X-ray generator. Although Cameron was silent on the issue, shortly afterwards, R.C. Emmons, the department chairman, proposed that if Bailey would study under W.L. Bragg and W.H. Taylor to learn the field, he would guarantee a faculty position upon his return. Bailey recognized a good deal when he heard one, so he and his new wife, Marilyn, went to England. He studied at the Cavendish Laboratory at the University of Cambridge, England with a Fulbright Scholarship from 1949 to 1951. His official advisors were Sir Lawrence Bragg in his first year and W.H. Taylor subsequently, but he credited his officemate, J.V. Smith, with teaching him single crystal diffraction methods. In 1955, he received a PhD in physics (X-ray crystallography), after completion of the refinement of the intermediate microcline structure.

Bailey returned from England in 1951 and started as an Instructor. He became an Assistant Professor in 1952, an

Associate Professor in 1956, and a full Professor in 1961. In 1976, he became the Roland D. Irving Distinguished Professor until his retirement in 1989, after which he became an Emeritus Professor. He served as the editor of *Clays and Clay Minerals* (1964–1970), and as President of the Clay Minerals Society (1971–1972), and he received that Society's highest research award, the Distinguished Member Award (1975). From 1973 to 1974, he was President of the Mineralogical Society of America and he was a recipient of that Society's distinguished research award, the Washington A. Roebing Medal (1990). He was also the President of the Association Internationale pour L'Etude des Argiles from 1975 to 1978 and he was the first recipient of its distinguished research award, the AIPEA Gold Medal. In 1990, he received the Neil Miner Award of the National Association of Geology Teachers (NAGT) for exceptional accomplishments as a teacher. In addition, Bailey was an Associate Editor of the *Journal of Sedimentary Petrology* (1960–1970), editor of the Proceedings of the International Clay Conference in 1972 and 1975, and the editor and organizer for the Mineralogical Society of America short course and proceedings volume on Micas in 1984 and then Hydrous Phyllosilicates in 1988. He was a Life-Fellow of the Mineralogical Society of America and an Honorary Member of the Mineralogical Society of Great Britain and Ireland.

Bailey was involved with feldspar research early in his career, but he turned his attention to phyllosilicates, and this is the area for which he is known best. In 1951, S.A. Tyler encouraged him to study the clay minerals of the Lake Superior iron ores, in which he subsequently found polytypic variations among the chlorite and serpentine structures. In 1956, the seminal study of mica polytypes was published by Smith and Yoder and, in 1957, Bailey derived the 12 standard polytypes of the serpentines following similar procedures. Although the polytype work became part of his lectures and courses, he waited 12 years to publish the results, when computers available to him became sufficiently powerful to enable calculation of the powder patterns. From 1960 to 1962, he derived the chlorite polytypes and followed this with structural refinements of chlorites and serpentines. By 1970, he redeveloped the description of mica polytypes to represent a more realistic atomistic view of crystal growth and, in so doing, he was able to unify the derivations of mica, serpentine, and chlorite polytypes. In the 1970s and 1980s, he examined the concept that cation ordering may be a more common phenomenon in phyllosilicates than previously thought due to ordering in subgroup symmetries. More recently, since his retirement, he had been developing the systematics of serpentine and chlorite periodic intergrowths. His contributions to phyllosilicate mineralogy, numbering over 100 published papers, extends far beyond descriptive aspects of individual structures. He popularized and extended the understanding of the nature and origins of the geometric constraints inherent in layer-type structures, and he helped

establish the basis for structurally combining component units. This work had an important impact in recognizing and predicting limitations to phyllosilicate composition, crystal morphology, and stabilities. In addition, his work forms much of the basis of the field of clay mineralogy. His work has both stimulated and guided the development of both clay mineralogy and phyllosilicate mineralogy. It is fitting that the mineral baileychlore, the Zn-rich chlorite end-member, was named in his honour.

Bailey was an extraordinary teacher, apparently comfortable in front of either small or large groups. His brilliant and successful career as a teacher developed from the qualities that make for an outstanding person: he responded to people with insight and respect, and both these traits were universally recognized by students and colleagues. With these traits come patience and fairness, which are qualities that students generally remember most. He treated students as equals and, in this way, established friendship through respect.

Bailey was a very reserved and quiet person. Thus, he let the subject matter be the star of the lecture — no flashy presentations, jokes, or emotional interactions. Instead, his lectures were craftily constructed and absolutely clear and precise. Each lecture was delivered fluently and with care. Usually, early introductory material was presented using simplified examples from less complex systems so that the student was properly 'set-up' to appreciate and handle more complex versions later. Clearly, the brilliance of his lectures was that he could systematically develop complex topics into a readily coherent and understandable course.

As organization and insight were the trademarks of Bailey's lectures, they were also key features of his writing. His sharp scientific insight was coupled to a clear and concise style of writing. His articles not only presented the data and conclusions, but he offered the reader a tutelage. The NAGT presentation of the Neil Miner Teaching Award in 1990 was one of the most satisfying of the many awards that he received; he was particularly pleased when he was complimented on his teaching.

Bull was devoted to his wife, Marilyn, of nearly 45 years and family. Before Marilyn's death and after the children had grown older, he and Marilyn would travel the world together, in part during lecture trips to warmer climates. He is survived by his son, grandson, daughter, brother, niece and two nephews.

Bull will be remembered by his many friends for his insightful scientific contributions and his genuine modesty. Along with a select group that includes George Brindley, Bill Bradley, M.L. Jackson and John Hower, Bull Bailey was a pioneer in clay mineralogy.

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STEPHEN GUGGENHEIM