

Memorial of Sturges William Bailey 1919–1994

STEPHEN GUGGENHEIM

Department of Geological Sciences, University of Illinois at Chicago, 845 West Taylor Street, Chicago, Illinois 60607-7059, U.S.A.

S. W. “Bull” Bailey died unexpectedly at his residence in Madison, Wisconsin, on the afternoon of November 30, 1994. Bailey was an outstanding scientist and teacher, and a wise counselor 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, Bailey received his nickname “Bull” from a buddy intent on linking him dishonorably (and “unjustly”) to two sisters named Weed by means of a variation of the lumber camp’s Bull of the Woods (i.e., tough doggedness). Because he himself used it, the nickname followed him everywhere but Cambridge, where he was instead known as “Bill,” after his middle name. 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 his usually quiet manner, for those who knew him well and with whom he felt comfortable, he had an earthy sense of humor that seemed almost shocking.

Bailey obtained a B.A. degree in geology from the University of Wisconsin in 1941, where he concomitantly received baccalaureate high honors 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 M.A. degree immediately upon graduating, World War II intervened, and he served in the U.S. Navy from 1942 to 1946 as an interpreter of aerial photographs. His formal education resumed upon his return home from service. Because 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 M.A. thesis under the direction of R. C. Emmons, and he graduated from the University of Wisconsin in 1948. For his Ph.D., 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, 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 Taylor subsequently, but he credited his officemate, J. V. Smith, with teaching him single-crystal diffraction methods. In 1955, he received a Ph.D. degree in physics (X-ray crystallography) after completion of the refinement of the intermediate microcline structure.

Bailey returned from England in 1951 and started

working 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 was a recipient of that Society's distinguished research award, the Roebling Medal (1990). He was also 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 editor and organizer of the Mineralogical Society of America short course and proceedings volume on "Micas" in 1984 and "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 dedicated in his service to the Department of Geology and Geophysics at the University of Wisconsin. Besides being chairman of the department from 1968 to 1971, he served as either a member or chair of nearly every committee. His devotion to the history of the department eventually developed into a book: *The History of Geology and Geophysics at the University of Wisconsin-Madison 1848–1980*. More important perhaps was the universal recognition by his colleagues that Bull was absolutely fair, generous, and above politics. This positioned Bull as wise counselor with high moral authority, which he used carefully and judiciously.

Bailey was involved with feldspar research early in his career, but he turned his attention to phyllosilicates, 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 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. This work clarified the nature of polytypism of these minerals and systematized the nomenclature, which was in complete disarray at the time with hundreds of ambiguous and useless names. By 1970,

he redeveloped the description of mica polytypes to represent a more realistic, atomistic view of crystal growth and, in so doing, was able to unify the derivations of mica, serpentine, and chlorite polytypes. In the 1970s and 1980s, Bailey examined the concept that cation ordering may be a more common phenomenon in phyllosilicates than previously thought because of ordering in subgroup symmetries. This work resulted in the systematic refinements of many layer silicates. More recently, since his retirement, he developed 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 to 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 guided and stimulated 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 honor.

Bailey was an extraordinary teacher, apparently comfortable in front of either small or large groups. Bailey's 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, traits that 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, 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. For example, in his crystal chemistry course, he early introduced the concept of superstructures with the Cu-Au alloys so that an analogy could be drawn for the complex feldspar superstructures near the end of the course. 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 with a clear and concise style of writing. His articles not only presented the data and conclusions but also 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 gotten older, he and Marilyn would travel the world together, in part during lecture trips to warmer climates. He is survived by a son, David S. Bailey, a grandson, Sean D. Bailey, a daughter, Linda M. Bailey, and a 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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¹ The complete bibliography of Sturges William Bailey may be ordered as Document AM-96-592 from the Business Office, Mineralogical Society of America, 1015 Eighteenth Street NW, Suite 601, Washington, DC 20036, U.S.A. Please remit \$5.00 in advance for the microfiche.