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WILLIAM RUBEY

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A Biographical Memoir by

W. G. ERNST

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William W. Rubey

WILLIAM WALDEN RUBEY

December 19, 1898–April 12, 1974

BY W. G. ERNST

WILLIAM WALDEN RUBEY died of cancer on April 12, 1974, in Santa Monica, California. Memorial services were held at the University of California, Los Angeles (UCLA), on April 25, and at the National Academy of Sciences (NAS) in Washington, D.C., on April 27. C. Barry Raleigh, David T. Griggs, Steven S. Oriel, and I spoke at the UCLA memorial, and Philip H. Abelson, Detlev W. Bronk, and Vincent E. McKelvey at the NAS service.

Bill Rubey was born in Moberly, Missouri, on December 19, 1898, the son of Ambrose Burnside Rubey and Alva Beatrice (Walden) Rubey. After attending high school in Moberly, he enrolled in the University of Missouri and received the A.B. degree in geology in 1920. During his senior year Bill married Susan Elsie Manovill, his lifelong companion and support. After graduation from college with highest honors, he continued academic studies at the Johns Hopkins University (1921–1922) and Yale University (1922–1924) for portions of the next four years, to some extent overlapping these with his concurrent work for the U.S. Geological Survey (USGS).

This latter association began in 1920 and extended practically unbroken for fifty-four years. Over this exceptionally long period of time, he exerted a strongly positive influence on the nature and thrust of research undertaken by the Survey, both through his own research and as a consequence of his widely

sought judgment in scientific policy and in personnel matters. During World War II he served as the USGS liaison with the armed forces and contributed substantially to the entrance of both the water resources and geologic divisions into various phases of military geology.

Bill left full-time employment with the USGS to accept a professorial appointment at UCLA in 1960, but continued survey-supported field studies in western Wyoming until the time of his death. In addition, he became the first director of the Lunar Science Institute (1968–1971), serving during the period of the return of Apollo Mission samples and conducting the most intensive scientific scrutiny yet received by natural materials.

Bill's scientific contributions have received international recognition and include: the systematics of stream hydrology; sedimentation, stratigraphy, compaction, and origin of sedimentary rocks; areal geology of parts of the midcontinent, the Great Plains, and the northern Rocky Mountains (especially the Black Hills and western Wyoming); the origin of the atmosphere, seawater, and chemical differentiation of the earth; mechanisms of overthrust faulting and mountain building; and the factors influencing the release of seismic energy. He was a brilliant generalist, studying the interconnections of geologic phenomena in virtually all the problems he addressed; he brought rigor and quantification to bear on many subjects that hitherto had seemed virtually intractable.

He contributed early papers involving the petroleum geology of parts of Arkansas, Oklahoma, and Kansas, and in general discussed the relationships among porosity, compaction, stratigraphy, and structure. Bill's early recognition of the magnitude of the Amarillo helium field influenced the government's decision to control its production. As a geomorphologist, he studied stream capture and the evolution of badland topography in the Great Plains and factors influencing river channel development in Illinois. His sedimentological and stratigraphic investigations

in the Black Hills and in western Wyoming led to the systematic description of the Colorado Group strata of Late Cretaceous age, to a discussion of the origin of the siliceous Mowry Shale, to the recognition of economic concentrations of vanadium and uranium in black shales and phosphorites, and to a major role in the drafting of the first American Stratigraphic Code in 1933. Sedimentological studies involved the quantitative elucidation of settling velocities and resultant size distribution of clastic grains deposited from a flowing aqueous medium. Other hydrologic investigations were directed toward the interdependence of flow regime, suspended particulate load, and bed topography.

Bill's 1951 presidential address to the Geological Society of America dealt with the origin of seawater, and was subsequently amplified in Geological Society of America Special Paper 62, which appeared in 1955; in this article, he demonstrated that the atmosphere and hydrosphere have accumulated gradually near the earth's surface over the course of geologic time as a consequence of the outgassing of the deep interior. This is perhaps Bill's best-known and most frequently cited work, although the papers co-authored with M. King Hubbert on the importance of aqueous fluid pressures in reducing frictional resistance to values low enough to allow slip along major, low-angle, previously enigmatic thrust faults may be equally famous. The clarification of the mechanism of overthrust faulting represents a major advance in structural geology. The solution to this perplexing problem grew out of Bill's concern for the origin of imbricate thrust structures such as he was mapping in western Wyoming; it shows how he applied his considerable understanding of physics to a general, first-order problem of tectonics. A related study involved the significance of the correlation observed by others of microseismic activity in the Denver, Colorado, area with fluid injection at the Rocky Mountain Arsenal, which in turn introduced a possible method of controlling release of earthquake energy in tectonically active areas.

This brief summary of some of Bill Rubey's more substantial geologic contributions gives an indication of his scientific breadth. However, this was but one aspect of his interests in the world around him. Bill was a perceptive, scholarly, and dedicated naturalist, as aware of the beauty to be found in the living environment as he was of geologic features. His fieldwork included considerable attention to botanical and zoological observations. He was an avid bird-watcher and an associate of the Ornithological Union. Wherever he went, he carefully compiled lists of confirmed sightings. His bibliography includes two articles dealing with barred owls and ravens, respectively. But while Bill's written contributions were in the natural sciences, he was both interested in and well informed about political and social problems and history. His wide interests are indicated by his initial choice of a major in journalism or forestry, rather than geology, at the University of Missouri. This early concern for forestry proved useful in his work on Cretaceous strata, which contain numerous fossil leaves and other plant remains.

Bill Rubey received many honors. He was elected to membership in the National Academy of Sciences in 1945 and the American Philosophical Society in 1952, was awarded the U.S. Department of the Interior Award of Excellence in 1943 and the Distinguished Service Award in 1958, received the National Medal of Science from President Lyndon B. Johnson in 1965, and was president of the Geological Society of America from 1949 to 1950 and received that society's highest honor, the Penrose Medal, in 1963. He was president of the Geological Society of Washington in 1948 and of the Washington Academy of Sciences in 1957. Bill was a member, fellow, or councillor of more than twenty learned societies. He was a fifty-year member of the American Association for the Advancement of Science and of the American Association of Petroleum Geologists. He received honorary degrees of D.Sc. from Yale University, the

University of Missouri, and Villanova University, and an LL.D. from UCLA.

Bill's counsel was held in exceptionally high esteem as reflected by his appointment to many official advisory committees and panels and as testified to by the innumerable requests from scientific colleagues for his thoughts on broadly ranging subjects. Invariably, Bill's advice was wisely and generously, but modestly and tactfully given. He was chairman of the Division of Geology and Geography (1943–1946) of the National Research Council (NRC) and served two terms (1947-1954) on the Council (chairman, 1951–1954). He was appointed to the council of the American Philosophical Society (1956–1959) and to the council of the National Academy of Sciences for two terms (1951–1954 and 1965–1968). He served on the boards of the American Association for the Advancement of Science, the National Science Foundation (1951–1955), and later was appointed by President Dwight D. Eisenhower for a six-year term to the National Science Board of the National Science Foundation (1960–1966). He was consultant to the National Aeronautics and Space Administration for a number of years and was a member of the U.S.–Japan Committee on Scientific Cooperation of the Department of State (1961–1964). In 1966 he served as an expert for the U.S. Corps of Engineers investigation of Denver microearthquakes and their possible connection with the Rocky Mountain Arsenal Disposal well; later he was appointed co-chairman of the Advanced Research Projects Agency (Department of Defense) Panel to investigate possible correlation of fluid injection and earthquake activity in the Rangely oil field in Colorado.

Bill was trustee of the Science Service Corporation (1956–1964), of the Carnegie Institution of Washington (1962–1974), and of the Woods Hole Oceanographic Institution (1966–1974). He was a visiting professor at UCLA in 1954, at Cal Tech in 1955, and at Johns Hopkins in 1956, and was Silliman lecturer at Yale

in 1960. In addition, he served on numerous university visiting committees. His services in these many advisory capacities were sought out not only because of his well-recognized breadth of experience, knowledge, and insight, but also because it was well known that he "did his homework" and came to meetings prepared for in-depth analysis of the problems at hand.

Bill Rubey influenced the course of earth science in yet another fashion. During his many years of productive associations in Washington, D.C., with the USGS, he hosted informal monthly seminars at his home that brought together some of the most active scientific minds in a region noted for scientific sophistication. A keynote speaker would introduce a subject of mutual interest—such as the chemical evolution of the earth's crust or the origin of life—and protracted but spirited discussion would follow. Judging from the comments of those who were privileged to attend, these think-tank sessions were both provocative and stimulating and in no small measure provided impetus for the development of contributions to various aspects of earth science.

Bill also affected earth science indirectly through his gentle but marked imprint on the many geologists within and outside the USGS privileged to share the joys of discovery in the field. Bill, who regarded himself primarily as a field man and as a general geologist, was happiest surrounded by the numerous field data on a mountaintop or in the desert. In his hesitating and modest manner, he shared these joys first with his contemporaries and later with the several generations of geologists he trained. He instilled the spirit of scientific inquiry without preaching it. By his own example of precise field investigation, he inspired others to study the rocks for the critical data before developing or accepting a working hypothesis. Then he would devise further field tests of the hypothesis. But perhaps his personality, as much as his scientific integrity, influenced both older and younger associates; here clearly was a man whose

respect was worth earning. His continuing imprint, particularly on the USGS, is assured by those geologists fortunate enough to have worked with Bill and now training or leading others.

Bill was appointed professor of geology and geophysics at UCLA in 1960, a position he held until his retirement in 1966; he was recalled to service each year thereafter and was scheduled to offer his seminar, "Advanced Topics in Geology," during the quarter in which he died. This study group, modeled on his earlier Washington, D.C., sessions, dealt with major unsolved problems in earth science, such as: the origin and evolution of mountain belts; the diversity of igneous, sedimentary, and metamorphic rocks; the growth of continents; the origin of ocean basins and of seawater; the evolution of the terrestrial planets; and so forth. Bill regarded himself as a general geologist, and this seminar reflected his conceptual understanding and method of addressing such large-scale, complex subjects. Bill's unique contributions here lay in directing the studies by judicious questioning and an open-minded, objective attack on the problems; only someone with his comprehensive appreciation of physics and chemistry, coupled with an extremely broad background in geology, could have organized and concluded such an ambitious course series. It was eminently successful. Each enrollee carried away a realization of the magnitude and interconnectedness of all problems in earth science; furthermore, each obtained an appreciation of how to address these problems constructively, quantitatively, and analytically. The success of Bill's seminar is reflected by the numerous retakers—students who came back for a second, or even a third, series of meetings.

Bill Rubey thus exerted a profound influence on the development of earth sciences over the past five decades in four specific ways: (1) through his own brilliant scientific works; (2) through his scientific advisory services to governmental agencies, to private foundations, and to universities; (3) through his stimulating, catalytic role as convener of informal but produc-

tive discussion groups, notably in Washington, D.C., and at UCLA, but also in countless other places in an even more informal but no less significant fashion, for a conversation with Bill over luncheon or a cocktail led many of his associates and companions to new insights and ideas; and (4) through the enthusiasm he generated in his colleagues and associates—whatever their initial status, he treated each as an equal, and many subsequently attained positions of leadership. His accomplishments in any one of these areas alone would be considered singularly distinguished. That he was able to contribute significantly in all four areas attests to the remarkable intellect, quality, and drive of this man.

Perhaps, however, Bill's capacity for constructive, innovative, and productive effort was made possible—or at least enhanced—by his unique personality. He was a truly humble, modest, almost detached but yet involved sort of person, who patiently honored and respected contrasting points of view. He was a perceptive, reflective, thoughtful man who rarely spoke before consideration; I never knew him to react in anger. He possessed a gentle but deep sense of humor, commonly directed at himself, and never made others feel uncomfortable. Bill was cooperative, considerate, generous, and was as near to selflessness as anyone I've ever been privileged to know. However, if I were required to select a single adjective to describe Bill Rubey, the word I would use would be *kind*; his actions invariably indicated profound regard for other people. He was understanding and compassionate. Bill was as warmly interested in those with whom he came into contact as he was in their works. He genuinely respected others as individuals, and I never met anyone who hadn't the highest regard for him.

Bill Rubey's scientific contributions have stood the test of time; they will assuredly continue to occupy a prominent place in the unfolding fabric of earth science and will provide inspiration for future research. However, his friendship and wise,

thoughtful advice will be greatly missed by those in the governmental agencies, institutions of higher learning, and private foundations who were privileged to know him. Earth scientists have sustained the profound loss of an internationally honored and respected colleague; an outstanding, stimulating teacher; and a kind, sympathetic friend. It can be truly said of him that he illuminated the motions of sand grains and mountains, the origin of the hydrosphere and the atmosphere, and, especially, the lives and careers of numerous colleagues.

Sue Rubey, a most remarkable woman in her own right, was a tower of strength throughout Bill's career and a special comfort to him during his terminal illness, even though she herself suffered from heart disease and cancer. Her condition worsened after his death and she passed away in Santa Monica on October 2, 1974. Of the Rubeys' three daughters, Susie Lee, Beth, and Jean, the latter two survive them—Mrs. Thomas A. Dean of Bel Air, Maryland, and Mrs. F. J. Eisenman, Jr., of Boca Raton, Florida, as well as children of all three.

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KEY TO ABBREVIATIONS

Am. Geophys. Union Trans.—Annu. Meet. = American Geophysical Union Transactions—Annual Meeting
Am. J. Sci. = American Journal of Science
Am. Philos. Soc. Year Book = American Philosophical Society Year Book
Am. Soc. Civil Eng. Bull. = American Society of Civil Engineers Bulletin
Bull. Am. Assoc. Petrol. Geologists = Bulletin of the American Association of Petroleum Geologists
Econ. Geol. = Economic Geology
Geol. Soc. Am. Bull. = Geological Society of America Bulletin
J. Sed. Petrol. = Journal of Sedimentary Petrology
Proc. Am. Soc. Civ. Eng. = Proceedings of the American Society of Civil Engineers
Proc. U.S. Natl. Mus. = Proceedings of the United States National Museum
U.S. Geol. Surv. Prof. Paper = United States Geological Survey Professional Paper
U.S. Geol. Surv. Bull. = United States Geological Survey Bulletin
U.S. Geol. Surv. Release = United States Geological Survey Release
Wash. Acad. Sci. J. = Washington Academy of Sciences Journal
Wyo. Geol. Assoc. Guideb.—Annu. Field Conf. = Wyoming Geological Association, Guidebook—Annual Field Conference

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