

Memorial to Mason Lowell Hill 1904–1992

ROLLIN ECKIS, MARIE HILL, DOROTHY STOUT

Mason Lowell Hill was born in Pomona, California, on January 17, 1904, two years before the great San Francisco earthquake, and died in Whittier, California, on March 11, 1992. His parents had migrated to California from Missouri and settled at the base of the San Gabriel Mountains, 20 miles from the San Andreas fault. This general area of the Los Angeles basin was the center of the rapidly developing petroleum industry in southern California. Hill's life was intertwined with these two geologic influences—the San Andreas fault and the oil industry.

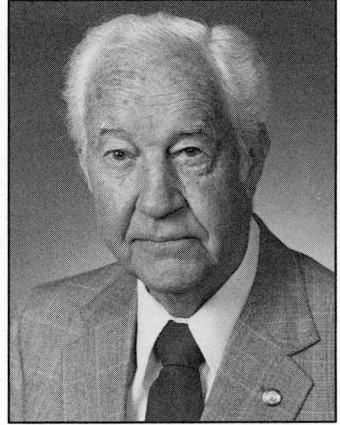
Hill's early education through high school was in Pomona. He had been a good student and in 1922 decided to attend nearby Pomona College. During registration Hill was fortuitously assigned to A. O. Woodford, who had established the geology department at Pomona College in 1920. Woodford, after questioning Hill about his high school subjects and his interests, convinced Hill he should take geology to satisfy his science requirement. This course induced Hill to become a geologist.

Woodford was a major influence in Hill's life. After graduation in 1926, Hill got a job at the Blackhawk gold mine in the eastern San Bernardino Mountains. Woodford visited Hill at the mine site and convinced him to return to college for a master's degree. He then spent a year at the University of California, Berkeley, Woodford's Ph.D. alma mater. There he came under the influence of Andrew C. Lawson, who had named the San Andreas fault and had headed the commission to study the fault after the 1906 event. At Berkeley, Hill also was influenced by Ethan Allen Hines, who taught him to be skeptical, and Warren J. Mead, a visiting professor from the University of Wisconsin, who awakened Hill's interest in structural geology.

At the time that Hill was beginning his career, oil companies were starting to hire geologists. The success of university-trained geologists who used newly developed techniques to understand surface and subsurface geology prompted the larger petroleum companies to establish their own geology departments. Shell Oil Company, one of the first companies to organize reconnaissance geologic teams, hired Hill, and he worked for 15 months in the western San Gabriel Mountains.

With the completion of his assignment with Shell, Hill used the knowledge gained during this period to complete a master's degree under Woodford at Claremont graduate school in 1929. His thesis, "Geology of the Western San Gabriel Mountains," contradicted the conventional thinking of the day because he identified the southern boundary of the San Gabriel Mountains as a reverse fault. His thesis was published in 1930 and was also presented at the Cordilleran Section meeting of the Geological Society of America held in Berkeley in 1930. His premise was accepted and later confirmed by the San Fernando earthquake of February 9, 1971, when reverse-slip movement occurred on the fault system along the southern boundary of the San Gabriel Mountains, raising them several feet.

After completion of his master's degree he worked another 15 months for Shell Oil Company, then resumed graduate work by entering the University of Wisconsin, which he had selected because of his desire to continue his studies with Warren J. Mead. There he also studied with C. K. Leith of Precambrian geology fame, A. N. Winchell and W. H. Twenhofel, and R. R. Schrock.



Hill's accumulated knowledge from field exploration provided the basis for his Ph.D. dissertation, "A Study of the Mechanics of Faulting," which examined movement on California faults. While at the University of Wisconsin he married Kay Maple, a Pomona College graduate who was teaching kinesiology. After Hill received his Ph.D. in 1932, they returned to California, where Kay took a job at Fresno State College. They eventually raised five sons. The slump in the oil business due to the Depression gave Hill the opportunity to teach at Coalinga Community College, but revival of the oil industry prompted his return to Shell in 1935.

In 1937, Hill, along with fellow Pomona College graduates Rodman Cross, Paul Dudley, Rollin Eckis, and Manley Natland, was chosen by Stanford-trained Chief Geologist Harold Hoots to join the newly formed exploration department of Richfield Oil Corporation. This department, with its groundbreaking techniques and methods, became the envy of many petroleum companies. Hill became a Coastal Division geologist in Ventura and upon Hoots's retirement and replacement by Rollin Eckis, became division geologist in Bakersfield. Eckis eventually went on to become president of Atlantic-Richfield Oil Corporation.

In 1947, Hill was involved in the discovery of the Russell Ranch oil field in the Cuyama Valley, a small basin with complex faulting west of the San Andreas fault. Other oil companies had explored this area and considered it to have no potential for oil production. The Russell Ranch oil field was developed rapidly, and a year later with another discovery, the South Cuyama field, Richfield Oil Corporation's oil reserves were doubled.

Hill effectively used trenching techniques to determine subsurface structure in petroleum exploration before this method became widely accepted. With a colleague he used trenching to establish the structural trap and determine the slip direction on the faults for the Capitan oil field discovery, located about 20 miles west of Santa Barbara. He believed that by understanding the sense of slip of faults, the strain pattern of either extension or shortening of the crust could be established.

In the early 1950s he spent two months on a reconnaissance of Western Australia and New Guinea. He found areas with attractive stratigraphic and structural aspects favorable for the accumulation of oil and gas, but the financial and technical requirements necessary in Cuyama Valley prevented further work in Australia.

Hill's writings advanced the growing science of structural geology. In 1947 he clarified faulting terminology by writing a landmark paper, published by the American Association of Petroleum Geologists, that introduced "right-lateral" and "left-lateral" in strike-slip faulting. This work was expanded in 1959.

In 1952 after years of collaboration and cumulative field work on both sides of the San Andreas fault, Hill, with his Richfield colleague, Thomas W. Dibblee, Jr., proposed at the 1952 meeting of the Pacific Section of the American Association of Petroleum Geologists in Los Angeles that rocks had been offset horizontally along the San Andreas fault by as much as 350 miles. They suggested that right-lateral offset began by mid-Cretaceous time with offset of basement rock facies of more than 350 miles; offset of Upper Cretaceous, 320 miles; offset of Eocene, 225 miles; lower Miocene, 175 miles; upper Miocene, 65 miles; and Pleistocene, 14 miles. This classic paper, "San Andreas, Garlock and Big Pine Faults, California," was published in 1953 in the *Geological Society of America Bulletin*. The concept enlarged the regional geologic picture for earth scientists and was widely debated at the time, but was later found to be in accordance with the new theory of plate tectonics.

Hill recalled, "I got the idea from Dibblee's maps and from reading the literature. The thing that gave me the inkling of 175 miles of strike-slip on the San Andreas was reading a paper on paleontology by P. F. Kerr and H. G. Schenck, Stanford University. They related their Oligocene-Miocene age megafossil faunal assemblage in the Gabilan area to a faunal assemblage of similar age in the San Emigdio Mountains studied by Wagner and Shillings. Maybe

their faunal assemblages were deposited in the same basin, in the same environment, and they had been separated by movement along the San Andreas fault. When I mentioned this to Tom, he said, "No reason why it shouldn't be."

Richfield Oil Corporation's first drilling venture in Alaska was Kenai #1 Well located on a topographic high that had been confirmed by seismic work. This discovery well of the Swanson River Field, on the Kenai Peninsula south of Anchorage, marked the first commercial oil production in Alaska and was probably the major inducement in making the territory of Alaska the 50th U.S. state in 1959. The capital realized from this venture supported field work for locating the Prudhoe Bay discovery well on the North Slope of Alaska in 1968. Prior to drilling, Richfield Oil Corporation was acquired by Atlantic Refining Company, and this merger became the Atlantic Richfield Company (ARCO). Hill became manager of exploration for the International Division of ARCO.

Hill's involvement with professional organizations led to posts as chairman of the Cordilleran Section of the Geological Society of America in 1955, Pacific Section president of the American Association of Petroleum Geologists in 1955–1956, and president of the American Association of Petroleum Geologists in 1961–1962. Between 1957 and 1959 he served on the Council of the Geological Society of America. He was also member #20 of the American Institute of Professional Geologists.

Shortly before Mason's retirement, Kay passed away. In 1969 at the age of 65 he retired in accord with the company's program. In 1974, five years after his retirement, he married Marie Clark, a former colleague on Richfield Oil Corporation's staff, and a family friend. In retirement, new career opportunities opened up.

Hill continued writing and teaching and also served as a consultant. He wrote articles for *Geotimes*, *Geology*, and the *Geological Society of America Bulletin*, in which his acclaimed article, "San Andreas fault: History of concepts," was published in 1981. He taught courses at Whittier College; California State University, Los Angeles; University of California, Irvine; and Pomona College. He served as a consultant with Atlantic-Richfield Company, Southern California Edison Company, Pacific Gas & Electric Company, Metropolitan Water District, and several geotechnical consulting firms. His work involved evaluating the potential seismic hazard in the design of the nuclear power plants at San Onofre. His consulting work with the Pacific Gas & Electric Company involved assessing the seismic risk hazard at the Diablo Canyon nuclear power plant site, on the coast south of San Luis Obispo.

Mason Hill was recognized with honorary membership in the American Association of Petroleum Geologists, Pacific Section of the American Association of Petroleum Geologists, American Institute of Professional Geologists, and South Coast Geological Society. In 1971 Woodford and Hill, teacher and student, were awarded honorary doctorate of science degrees by Pomona College. The American Association of Petroleum Geologists presented him with its highest award, the Sydney Powers Memorial Medal in 1981, recognizing his "leadership in discovery thinking, his outstanding contributions to better understanding of the nature of faulting, the high esteem in which he is held by his fellow geologists, and his many other accomplishments." The South Coast Geological Society dedicated the 1982 volume *Geology and Mineral Wealth of the Transverse Ranges* to Mason L. Hill. The dedication to Hill stated that his was a "life dedicated to the love of geology, the desire to understand geology, and the wish to convey his comprehension to others." In 1984 he became president of the Branner Club, an organization that meets quarterly at the California Institute of Technology. In April 1991, Hill was the first recipient of Pomona College's Distinguished Service Award.

In 1986, Hill co-chaired a Geological Society of America Cordilleran Section symposium in Los Angeles on the history of geology in California and presented a paper entitled "Misinterpretations by Early California Geologists, Including Me." He scrutinized mistakes made by

geologists through the decades of unfolding California's geologic history, including his own misinterpretations, adding that "geology advances by new concepts, both good and bad, because they generate controversy and additional research."

Hill was selected to edit the Cordilleran Section's Centennial Field Guide for the Geological Society of America's Decade of North American Geology series. The volume includes articles on the San Andreas fault and on formations related to petroleum geology.

His avid curiosity, gregarious personality, lust for learning, precision in terminology, streak of iconoclasm, and ability to challenge conventional thought, all made him an invaluable observer and contributor to the present understanding of geology, especially California's complex geology.

Hill is survived by his wife, Marie; five sons, James, Robert, Laurance, John, and Thomas; eleven grandchildren; and one great-grandchild.

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