

# Memorial to Gordon Andrew Macdonald 1911-1978

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Gordon Andrew Macdonald, Senior Professor of Geology and Geophysics, Emeritus, at the University of Hawaii, and former Scientist in Charge of Hawaiian Volcano Observatory, U.S. Geological Survey, died at his home in Lanikai, Hawaii, on June 20, 1978, of cancer after an apparent illness of only several weeks. His countless friends in Hawaii and in the U.S. Geological Survey were shocked and saddened at his sudden death.

Gordon Macdonald led a full life. In his busiest day he could find some moments to guide a student, a caller from some government agency, or a new acquaintance. He was a loving husband and the father of four fine sons. Mac, as he was known to his many friends and colleagues, was impressive in his ability to size up the main strengths and weaknesses of a geologic argument. We respected his counsel as much as we enjoyed his Hawaiian lore, and in particular his recitation of legends of Madame Pele. To the citizens of the Puna District of the Island of Hawaii, dwelling with Pele on the flank of Kilauea, he was the Volcano Doctor, successor of the Volcano Doctor T. A. Jagger, and during eruptions or between eruptions he would patiently explain in simple words the power of the volcano and the likelihood of their being affected by it. To discriminate from others having similar names, according to William Benson of the National Science Foundation (and Mac's one-time branch chief), he was known in Washington as Gordon Aloha Macdonald.

Throughout the geologic community Mac will be remembered through his voluminous contributions to volcanology and other aspects of geology. His bibliography has more than 200 entries, of which more than 100 are substantial articles and bulletins. The books *Volcanoes in the Sea: The Geology of Hawaii* (with A. T. Abbott, 1970), and *Volcanoes* (1972) are about his favorite subjects, and he edited other volumes. The remainder includes 7 maps of Hawaii and northern California in the U.S. Geological Survey GQ series (plus part of Haleakala National Park), 21 abstracts, 26 contributions to *Volcano Letter* during 1942-1955, and nearly 60 guidebook, encyclopedia, and atlas articles, as well as book reviews, memorials, published reports to international commissions, and review articles.

Mac was born in Boston, Massachusetts, October 15, 1911. He earned his A.B. in 1933 and his M.A. in 1934 in geology at the University of California at Los Angeles. He played a flute in a Santa Monica dance band to help pay his way in college, assisted Francis Shepard in collecting samples in Santa Monica Bay, and was introduced by William J. Miller to petrology. He continued his graduate studies in Berkeley.

Any student is impressed by his professors; there is no doubt that Mac's impressions at the University of California were both strong and favorable. On numerous occasions in later years Mac would illustrate a point by recounting what one or another

of the Berkeley faculty had done in a similar situation. Norman Hinds as a popular lecturer, George Louderback in petrology, and N. L. Taliaferro in the field were in his anecdotes, but obviously the oldest, Andrew C. Lawson, and the youngest, Howel Williams and Charles Anderson, drew Mac's greatest interest. On one occasion Andy Lawson had a field class in the Berkeley Hills, plunked himself on a rock, and gave them the morning to find and sample the basalt that cropped out somewhere within a few hundred yards. When all had reassembled crestfallen, Lawson guffawed that of course he knew they had missed it because he had been sitting on the only outcrop of basalt. Mac tried never to miss an outcrop; he never let awe of an official keep him from a polite but firm press toward what he thought was a proper goal.

As an instructor Mac associated with other young instructors and graduate students such as Charles Gilbert, Richard Merriam, and Cordell Durrell, and, more importantly, met Ruth Carol Binkley in one of his labs. He and Ruth were married in 1938, the same year in which he received his Ph.D. for a thesis on the Sierra Nevada near Fresno and went to work for the Shell Oil Company in the west side of the San Joaquin Valley and the Temblor Range.

In 1939 Mac became an assistant geologist with the U.S. Geological Survey and was appointed to the Territory of Hawaii where Harold T. Stearns was District Geologist. The U.S. Geological Survey, in conjunction with the Territorial Division of Hydrography, was in the midst of a program of mapping the islands and describing their ground-water resources. Mac's initial work entailed five months of detailed mapping to discover the source of a large spring in the Nahiku area of East Maui, a task that had eluded earlier investigators W. O. Clark, Howard Powers, and Joel Swartz. Until 1941, when he was promoted to Associate Geologist, Mac described the petrology of the Kahoolawe, Lanai, Waianae, and East Maui (Haleakala) volcanoes, in the bulletins of their geology that Stearns published. Stearns and Macdonald recommended sites for wells and quarries for the military camps, fortifications, and air strips that were sprouting everywhere. Little could be published; initially, the 1942 Mauna Loa eruptions were even kept out of the local newspapers. Mapping of the island of Hawaii was a major effort. Stearns, who had started in Kau as early as 1924, continued on the south and west sides, which included most of Mauna Loa and Hualalai volcanoes as well as part of Kohala. Mac mapped the North and South Puna, North and South Hilo, Hamakua, and South Kohala Districts, including most of the Kilauea, Mauna Kea, and Kohala volcanoes. His map work covered about 5,000 km<sup>2</sup>, with a relief of 4,000 m. Much of the time Mac was either in Hilo or at the Volcano Observatory where Ruy Finch had succeeded Thomas Jagger.

After World War II, Mac became District Geologist, worked on the petrography of Niihau, and completed the mapping of Molokai that Stearns had started in 1935. For the 1947-1948 year Mac taught at the University of Southern California. He enjoyed the teaching aspect and his association with such colleagues as K. O. Emery and Bill Easton, who also were interested in Pacific geology, but he missed Hawaii. He returned to the islands in the late 1940s, mapping on Kauai and finishing his definitive paper on the Hawaiian petrographic province.

From 1951 to 1956 Mac was Scientist in Charge of Hawaiian Volcano Observatory. Kilauea erupted in 1952, 1954, and 1955. Chester Wentworth, who had retired from the Honolulu Board of Water Supply, and Jerry Eaton, later to be chief of the U.S. Geological Survey office of earthquake research, were also there during those exciting times. Nearly 10<sup>7</sup> m<sup>3</sup> of lava was erupted in 1955. During the later phases it became possible by monitoring the seismicity patterns to predict the time and place of

eruptions with the result that (from Macdonald and Hubbard, 1951, rev. ed., 1975) "for the first time in history the entire sequence of formation of volcanic vents was studied by scientists at close range. First a barely-visible crack opened in the ground, then gas started to rise from the widening crack with gradually increasing pressure, then a bulb of red-hot lava a few inches across pushed out, gradually expanding, gas started to burst through it, and a lava fountain and flow were formed."

When Mac's period at the observatory ended in 1956 he was assigned to the Denver office, and his field area became the volcanic terrane of the southern Cascade Range and the Modoc Plateau. His heart remained in Hawaii, however, and so he was recruited by the University of Hawaii. Robert Hiatt, then Director of Research, tirelessly worked to improve the breadth and quality of the university, which until then had been known mainly for its colleges of education and agriculture. One of his schemes to circumvent the rule that a person had to teach 12 to 15 hours per semester was to set up a series of research institutes, so that a person might be appointed jointly to a teaching department and to a research institution. Another was to institute a grade of research professors, entitled Senior Professors. Mac returned to Hawaii in early 1958 as Senior Professor of Geology and Geophysics, the first scientist appointed to the brand-new Hawaii Institute of Geophysics, and the second geologist in the geology department. He and Agatin Abbott developed the department's undergraduate and graduate programs to complement the Institute of Geophysics. Quite to the contrary of the initial expectation, during the nearly two decades he taught in Hawaii Mac's teaching load, in proportion to his percentage appointment, was the heaviest by far, and at his own request. He also rated at the top in student polls year after year. Mac was especially effective in those subjects that he himself enjoyed: introductory physical geology, geology of the Hawaiian Islands (a course of his own design for non-majors), petrology, field methods, and seminars in volcanology and igneous petrology. The department has from this superb teacher a legacy of neatly labeled specimens that he collected from the Franciscan of the Binkley Ranch, the Miocene of the Tumbler Range, and from volcanic rocks found throughout Hawaii, the western United States, Pacific islands, and Europe.

Mac's research with Hawaii Institute of Geophysics continued in volcanology and petrology. He became more and more convinced of the need to base interpretations of volcanoes on detailed mapping, high-quality chemical analyses, and the integration of a wide range of geophysical studies. Much of his work was individual, part was through graduate students, and part was in association with such scientists as G. P. Woollard, T. Katsura, and H. A. Powers. Mac was a powerful force in helping George Woollard shape Hawaii Institute of Geophysics. He was adamant, however, in refusing any sort of administrative position in the institute or department; his time as District Geologist and as Director of the Volcano Observatory had filled his stomach with petty bureaucracy.

In the legislation establishing Hawaii Institute of Geophysics, the institute was required to have on its staff the State Geologist and State Volcanologist. Although there is now no record that Mac was formally titled as such, certainly he acted in those capacities. He was the state and county civil defense advisor during eruptions and in planning; he instigated the tsunami-limit maps now available to everyone in the telephone directories; he was a strong member of the State Commission for Natural Area Reserves; and after the unexpected death of his friend Ag Abbott, he directed the drilling of the first successful geothermal well in Hawaii.

As a Fellow of four different scientific societies—the Geological Society of

America, the American Geophysical Union, the Mineralogical Society of America, and the American Association for the Advancement of Science—Mac was honored by his fellow scientists in his lifetime. He was a past president of the International Association of Volcanology and Chemistry of the Earth's Interior (IUGG) and of the Section on Volcanology and Petrology (AGU). An American Red Cross award for outstanding service to humanity (1956), a University of Hawaii award for excellence in research, and appointment to various local to international commissions dealing with volcanic hazards are testimony to his deeply held belief that science should serve man.

The walls of Mac's office held a range of photographs, drawings from G.J.P. Scrope (British nineteenth-century volcanologist), and *New Yorker* cartoons of volcanoes, but over his desk were photographs of the three persons he said most influenced his career: Howel Williams, whose seminars in 1935 first aroused his interest in volcanoes and their products; Thomas A. Jaggar, who established Hawaiian Volcano Observatory and gathered a voluminous record describing volcanic activity in Hawaii since 1911; and Alfred Rittmann, who has stressed the humanitarian aspects of volcanology along with the scientific in his direction of the International Center of Volcanology in Catania, Italy.

After his retirement, Mac split his time between his two homes, one on the outer caldera rim of Kilauea so that he could assist as needed at the Volcano Observatory, and the other at Lanikai, an isolated suburb of Honolulu within the eroded caldera of the Koolau volcano looking over the ocean, where he continued to study Hawaiian seismicity and plan a hiking trip through the Alps with his second wife, Virginia. A widower after Ruth passed away, Mac met Virginia Brooks in her work with coastal-zone and conservation planning. Virginia, an architect, survives him, as do his sons from his first marriage, John Alan, James Gordon, Duncan Edwin, and William Andrew. With them, we say *Aloha* to Gordon Macdonald.

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