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AARON CLEMENT WATERS
1905–1991

A Biographical Memoir by

CLIFFORD A. HOPSON

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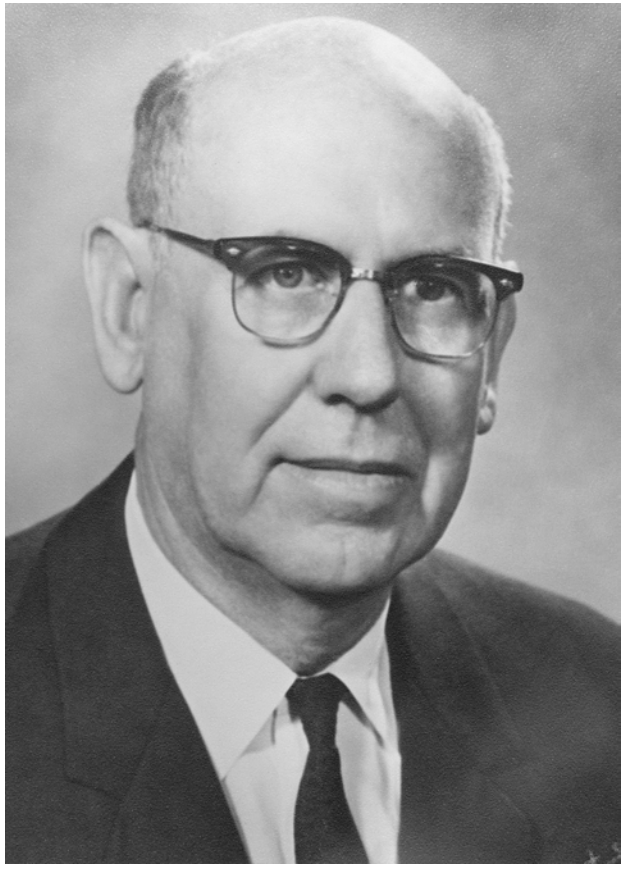
Biographical Memoirs



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Aaron C. Waters

AARON CLEMENT WATERS

May 6, 1905–May 18, 1991

BY CLIFFORD A. HOPSON

AARON C. WATERS, ONE OF the leading volcanologists of the twentieth century, passed away on May 18, 1991, at age 86 in Tacoma, Washington. Professor Waters, best known for his pioneering work on the Columbia River Basalt, led the way also in other studies of basaltic volcanism in the Pacific Northwest, the mechanics of basaltic lava flows, the development of lava-tube cave systems, and violently explosive basaltic volcanism recorded by maar-type volcanoes. This expertise led directly to his participation in studies of lunar geology as the U.S. space program got underway, including composition and origin of the lunar surface, the assessment of Apollo landing sites, and geologic training of the Apollo astronauts. But it was the breadth of Aaron Waters's geologic accomplishments, rather than specialization, that marks his distinguished career. He made important contributions to our understanding of calc-alkaline volcanism, to granitoid batholiths and their hypabyssal intrusive complexes, to deep-seated metamorphism, and to the geomorphic evolution of landscapes as well as facets of structural and economic geology. The Pacific Northwest region was the focus of his diversified studies, and he was regarded for many years as the leading geologic authority on that region. Yet, his studies extended also to other parts of the United States,

the world, and the Moon. Professor Waters was known, too, as an outstanding mentor of graduate students, the coauthor of a leading textbook on the principles of geology, the builder of distinguished geology departments in leading universities, and, late in his career, a valued geologic consultant to federal research organizations.

BEGINNINGS AND EARLY DIRECTIONS

Aaron Waters was born in Waterville, Washington, on May 6, 1905, the son of pioneer parents and the youngest of seven children. His early years were spent on the family homestead and wheat ranch near Waterville, on the western edge of the Columbia River Plateau in the shadow of the Cascade Mountains. He worked on the ranch during his youth and helped to run it at age 12 and 13 during the last years of World War I, when his older brothers went off to war. Following graduation from high school, Aaron entered the University of Washington, supporting himself by work in a gas station and other jobs. He began prelaw studies but later changed to geology, partly from his love of the out-of-doors but influenced especially by his college friend Richard E. Fuller, who later became both a distinguished geologist and a long-time director of the Seattle Museum of Art. Waters earned a B.Sc. in geology (cum laude) in 1927 and an M.Sc. in 1928, both from the University of Washington.

Waters continued his studies at Yale University, known for its program in geology and development of leaders in that field. He earned his Ph.D. in 1930 under the mentorship of Professor Adolph Knopf. His dissertation, "Geology of the Southern Half of the Chelan [30'] Quadrangle, Washington," provided the basis for several outstanding papers, and had a lasting influence on the direction of his career. The eastern part of his map area overlapped the Columbia

River Plateau, one of the world's great outpourings of tholeiitic plateau basalt. His doctoral study of those lavas was a first step toward later preeminence in the study of plateau basalts and leadership in establishing the stratigraphy of the Columbia River Basalt Group. The western part of the Ph.D. map area exposed the pre-Tertiary crystalline basement of the North Cascades. Here his work encompassed both the bedrock geology and the geomorphology, also leading to important publications.

THE STANFORD YEARS: PART 1, 1930-1941

The first taste of university teaching came during his doctoral studies at Yale, where Waters served as instructor in the Geology Department (1928-1930). Teaching proved congenial and complimentary to his research interests, and it was here that his ability to stimulate and motivate students first blossomed. Here, too, the choice of a career was determined and with his scholarly reputation growing, Waters accepted appointment as assistant professor of geology at Stanford University. He soon rose to professor and remained at Stanford for 21 years (1930-1951).

Waters's early research was not yet focused on volcanic rocks but reflected broad interests in Pacific Northwest regional geology, interests that spanned igneous and metamorphic petrology, geomorphology, and tectonics. His stature and reputation grew as the excellence of his published research during the prewar period (1930-1941) became widely recognized and appreciated. Two influential papers soon emerged from continued work on the bedrock geology of his Washington field area: "A Petrologic and Structural Study of the Swakane Gneiss" (1932) and "Petrology of the Contact Breccias of the Chelan Batholith" (1938). The latter was the first of several perceptive studies of granitoid pluton emplacement and crystallization.

Aaron's interest in geomorphology vied with that in petrology during his early years at Stanford. He deciphered the complex record of Pleistocene glaciation, where the continental ice sheet—advancing across and retreating from the Columbia River Plateau—had dueled with the alpine glaciers flowing down from the Cascade Mountains. Their interaction is brilliantly documented in "Terraces and Coulees along the Columbia River near Lake Chelan, Washington" (1933). His "Resurrected Erosion Surface in Central Washington" (1939) was followed later by other papers (e.g., 1955) that describe the geomorphic evidence for Neogene deformation of the southwestern margin of the Columbia River Plateau and uplift of the Cascade Mountains. These and other aspects of Aaron's early studies in north-central Washington and his coeval projects in Oregon (e.g., 1927, 1929, 1935), along with his exceptional breadth spanning volcanism, plutonism, metamorphism, geomorphology, and tectonics contributed to Aaron's growing reputation as an expert on regional geology of the Pacific Northwest.

Aaron Waters's arrival at Stanford also ignited a new interest (cataclasites and mylonites) launched by his discovery of those distinctive rock types along the San Andreas Fault zone near Crystal Springs Lake. The San Andreas was an enigma back then: It was thought to be a "big" fault from the contrasting rocks on each side, but its huge strike-slip displacement was not yet recognized. Mylonites had first been described along faults in Scotland, so their occurrence here within the San Andreas Fault zone seemed consistent with a fault-related origin. With doctoral student Charles Campbell he studied the rocks petrographically, reviewed the occurrence of similar rocks elsewhere, and devised a descriptive and genetic classification for mylonitic rocks (1934) that remained authoritative for many years.

His papers led to a Guggenheim Fellowship for studies in Scotland and Scandinavia in 1938-1939, where other mylonites reinforced his awareness of the role of penetrative mechanical deformation in developing fine-grained, banded crystalline rocks. It was therefore no accident that his next major field study, with doctoral student and later distinguished professor Konrad Krauskopf, addressed the unique banded granodioritic rocks that bordered the eastern side of Washington's Okanogan Valley. Their resulting paper, "The Protoclastic Border of the Colville Batholith, Washington" (1941), attracted wide interest. Known now as the Okanogan gneiss dome and recognized as one of a semicontinuous belt of metamorphic core complexes that extend from southern Arizona to British Columbia, it records the penetrative deformation of midcrustal crystalline rocks and hypersolidus mushes, later brought to the surface during crustal extension. But the fundamental role of protoclastic deformation—the penetrative crushing, granulation, and neorecrystallization of rock in the presence of an interstitial melt phase—first established by Waters and Krauskopf, remains valid today.

Another aspect of Professor Waters's Guggenheim studies in Scotland, however, had greater influence on the direction of his future work. His examination of the Tertiary volcanic centers and ring-dike complexes on the Inner Hebrides islands of Mull, Ardnamurchan, and Skye returned his attention to basaltic volcanism and its shallow plutonic connections, This became a focus of his research.

THE WAR YEARS (1942-1945) AND AFTERMATH

World War II intervened, and Waters took leave from Stanford to join the U.S. Geological Survey's expanded exploration program for strategic minerals, deemed vital to the war effort. Mercury was among those essential metals

whose known reserves were limited, and Waters teamed with other volcanologists—mercury ores being associated with volcanic and subvolcanic rocks—to improve the inventory. His introduction to mercury (quicksilver) deposits had begun in the prewar years in southwestern Oregon (1935), and these were now the focus of his war-related fieldwork in Arkansas, Oregon, and elsewhere in the western United States. Resulting U.S. Geological Survey (USGS) publications appeared in 1951. Beyond the primary purpose of strategic mineral assessment, this work extended Waters's grasp of regional volcanism in Oregon, and the volcanogenic processes that concentrated trace elements.

A brief return to ore deposits research came with Waters's participation in the USGS's uranium exploration program on the Colorado Plateau (1951-1952), where volcanogenic processes once again proved important (1953). Here the search for magmatic sources of the strata-bound uranium ores led to his collaboration with Charles B. Hunt on the petrology and petrogenesis of subvolcanic rocks of the North La Sal stock and its laccoliths (1958).

THE STANFORD YEARS: PART 2, 1945-1951

Professor Waters's return to academic geology at Stanford (1945-1951) marked the beginning of his main concentration on volcanism and volcanic rocks, especially basalts of the Pacific Northwest, soon to flower after his subsequent move to Johns Hopkins. This work began during the summers of the late 1940s with his geological mapping in north-central Oregon, as part of the USGS's regional geologic mapping program that had evolved from the strategic minerals program of the war years. This reconnaissance mapping extended Waters's knowledge of the Columbia River basalts and other Tertiary volcanic rocks.

But a more immediate task came first. Waters and close friend James Gilluly, then a professor at the University of California, Los Angeles, and Professor A. O. Woodford of Pomona College, had become disenchanted with the existing textbooks on introductory physical geology, and began to write one of their own. The first edition of *Principles of Geology* (1951), superbly illustrated by the skillful drawings of Stanford colleague Robert R. Compton, was an immediate success. This book, substantially improved in its second edition in 1959 and its third edition in 1968, remained the leading physical geology textbook for more than two decades.

THE JOHNS HOPKINS YEARS, 1952-1963

A uniquely productive and happy period of Aaron Waters's career came with his appointment in 1952 as professor of geology at Johns Hopkins University in Baltimore, a position he would hold for the next 11 years. His appointment was part of a profound resurgence of the university's geology department, engineered by its new chair, Ernst Cloos. Cloos hired both Waters and famed sedimentologist Francis Pettijohn, followed by experimental petrologist Hans P. Eugster plus several younger men. Cloos, Pettijohn, Waters, and Eugster were all elected to the National Academy of Sciences within the next dozen years; they, together with veteran mineralogist and X-ray crystallographer J. D. H. Donnay (later elected president of the Mineralogical Society of America), formed the nucleus of an exceptionally strong graduate program and center of research excellence. It was a close and congenial group that interacted and worked well together. Good friends Waters and Cloos were an especially effective team: Chairman Cloos was a kindly but strong and progressive department executive who ran a harmonious ship, and Waters worked effectively behind the scenes

to help strengthen the department and to attract bright students to its graduate program. The highly successful cooperative program between the Johns Hopkins geology department and the Geophysical Laboratory (Carnegie Institution of Washington) in nearby Washington, D. C., whereby Hopkins graduate students undertook doctoral research projects in experimental petrology at the "Geewhiz Lab," was one of the fruits of Aaron Waters's progressive thinking and influence.

It was during his Hopkins era that Waters wrote and published several of his most important volcanological papers: "Volcanic Rocks and the Tectonic Cycle" (1955), "Stratigraphic and Lithologic Variations of the Columbia River Basalt" (1961), and "Basaltic Magma Types and Their Tectonic Associations: Pacific Northwest of the United States" (1962). Waters also spearheaded a meaty revision of the Gilluly-Waters-Woodford textbook (2nd edition). He also researched and wrote at that time (with younger colleagues Richard Fiske and Clifford Hopson) the monograph "Geology of Mount Rainier National Park, Washington" (1963). This project was organized and led by Waters, who generously gave both younger men their choice of topics (Fiske took the Tertiary volcanogenic formations; Hopson, Mount Rainier volcano) and relegated himself to last position in the authorship. Yet, the section of the Mount Rainier monograph written by Waters on the "Miocene Tatoosh Pluton and Its Hypabyssal Intrusive Complexes" is perhaps the most insightful part of that study.

The Johns Hopkins years were marked also by his mentoring of an exceptionally able group of graduate students (J. G. Moore, R. S. Fiske, D. L. Lindsley, R. Shepard, D. Swanson, H.-U. Schmincke, W. S. Wise, and others), who later rose to prominence in volcanology. When Mount St. Helens awoke from a long quiescence in 1980, two of the

three volcanologists who helicoptered daily to monitor the volcano before and after its cataclysmic eruption of May 18, 1980, were Waters's former Hopkins doctoral students (Moore and Swanson). His Johns Hopkins years were truly a uniquely active and creative period in Aaron Waters's distinguished career.

THE UNIVERSITY OF CALIFORNIA YEARS: 1963-1972

Always receptive to new challenges, Professor Waters returned to his West Coast roots in 1963, accepting the chair of the budding Geology Department at the University of California, Santa Barbara (UCSB), slated to grow into a major University of California campus. He soon improved the department's standards and brought aboard new, research-oriented faculty members who enlarged the department and enhanced its stature. Having launched the department at Santa Barbara into productive growth, he turned an attentive ear to the offered opportunity to build a geological program from the ground up at the University of California's newest campus at Santa Cruz (UCSC). The challenge proved irresistible and Waters transferred to UCSC in 1967, plunging once again into the demanding task of department building. Outstanding faculty appointments were soon made, and—despite the still small size of the group—a Ph.D. program in earth sciences was established under Waters's leadership. By the time of his formal retirement in 1972, the graduate and undergraduate programs in earth sciences at UCSC were flourishing.

Professor Waters's expertise in volcanology opened the way for a new, exciting field of research and teaching during the Santa Barbara and Santa Cruz years: lunar geology and exploration of the Moon's surface. With NASA's Gemini Project to orbit the Moon, and the follow-up Apollo Project to land on and sample its surface, an urgent need arose to

learn more about the geological processes that had shaped the lunar surface and operated within its interior. Such knowledge was needed to explore and sample effectively and to geologically train the astronauts who would do the sampling. Waters's preeminent qualifications as a volcanologist soon involved him in several important aspects of this exotic program, including deciphering the record of volcanism and meteor impacts on the lunar surface, the assessment of Apollo landing sites, and the geologic training of the astronauts. His monograph on "Moon Craters and Oregon Volcanoes" stemmed from the Condon Lectureship held by Waters in 1967.

Some lunar craters bore a marked resemblance to terrestrial maar-type volcanic craters, formed by highly explosive basaltic eruptions, but not enough was yet known to compare them effectively. Waters therefore teamed with UCSB volcanologist Richard V. Fisher in a dedicated study of terrestrial maar volcanism at localities ranging from the western United States to the Philippines (Luzon), the Azores (Capelinhos) in the Atlantic, to Germany (Lacher See district).

Thus, his UCSB and UCSC years (1963-1972) involved department building and teaching, the guidance of graduate research, a heavy involvement in lunar programs and astronaut training, the research and publication of terrestrial maar-type volcanism, and the extensive revision and expansion of the *Principles of Geology* textbook, leading to its third edition in 1968.

THE CONSUMMATE PROFESSOR

Although Aaron's election to the National Academy of Sciences (in 1964) and other honors largely reflected his prowess as a researcher, it is his towering reputation as a teacher, particularly of graduate students, for which he is

perhaps best remembered. He was rigorous but made learning an adventure and fun, whether in the classroom, the lab, or out in the field.

His classes were rewarding, and his outstanding graduate course on petrogenesis became a rite of passage for many future researchers. But it was his ability to motivate and guide graduate students that earned his reputation as an outstanding professor. He could be tough, yet his genuine warmth and acts of kindness are legendary. Though much of his teaching career predated the years when large research grants tended to tie graduate students to sources of financial support, limiting their choice of mentors and dissertation topics, Waters always had more than his share of good students. Many gravitated to him for guidance, partly because of his specialty fields, partly because of his sterling reputation, and perhaps because of a mystique that drew students to him. One could expect his expert guidance of dissertation projects but with a loose rein that encouraged individual initiative and alternative interpretations, even those that ran counter to his own published work. In summing up his qualities, it is hard to improve on an earlier description by three of his close former colleagues:

> Those who knew and worked with Aaron remember him as forthright and vigorous, a person of enormous vitality and a pointed sense of humor, the latter often marked by a characteristic arched eyebrow. Behind what to some seemed a gruff persona, he was a kind individual, enormously supportive and helpful to students and colleagues. In turn, he expected the best from them in terms of effort and accomplishment. Woe to the individual who turned in slipshod work! Such an event could make Aaron erupt in frustration, leading some students to think that his choice of volcanology as a specialty was entirely appropriate. But students always knew that Aaron had faith in them, often more faith than they had in themselves. Generations of his students have come to recognize that both Aaron and Elizabeth were as devoted to their futures as to the classwork at hand" (Krauskopf et al., 1992).

Another part of Aaron's mystique was an indefinable sense that graduate research was almost a family affair. The research itself was hard-driving, no-nonsense work, yet Aaron was a genial host to his students on frequent social occasions. That one came to feel almost like one of the family at such times was due to the hospitality and warmth of hostess Elizabeth Waters. Aaron and Elizabeth functioned marvelously as a team: He provided the leadership and critical guidance to students while she was indispensable in social backup.

Elizabeth von Hoene Waters was also a native of Washington State, but Aaron and Elizabeth met and courted in California while Aaron was a young prof at Stanford. Elizabeth, an art history major at prestigious Mills College, graduated with honors in the morning of June 10, 1940, and married Aaron that afternoon. They honeymooned at Mount St. Helens, where he was doing fieldwork, and they remained a devoted couple through 51 years of marriage.

The Waters hospitality to his, or rather to *their* students, seemed like part of the deal. And Elizabeth could provide good advice along with her tasty cooking. As one of his grad students, I recall bringing a new girlfriend to one of the Waters' evening socials. Elizabeth took me aside later on: "Don't let her get away," she solemnly advised. There were other considerations of course, but now, after 50 years of marriage to this same lady, I still recall and appreciate the sagacity of Elizabeth's advice and her approval. An endowed fund for graduate research at UCSC is fittingly called the Aaron and Elizabeth Waters Graduate Award.

RECOLLECTIONS

Some humorous—in retrospect—incidents are part of the Waters legacy. Aaron used to enjoy recalling a conversation between two graduate students that he overheard while

still a young assistant professor at Stanford. Austin Flint Rogers, the famed mineralogist, had just retired from teaching, and Waters was slated to take over his petrology course. "Well," one student was overheard to say, "maybe Waters can fill Rogers's pants but he can't fill his shoes!" Now, one smiles when recalling that the petrogenesis course that Waters soon developed at Stanford later became famous at four universities.

There was also the time, still in the middle 1930s, when two of the giants of American geology—Bailey Willis of Stanford and Andrew Lawson of the University of California, Berkeley—were seminar guests at the Waters home. Both men, known for their strong convictions and fiery dispositions, were friends but also professional rivals, especially on siting the foundations for the Golden Gate Bridge, for which both were consultants. A hot argument over the south abutment developed between them that evening, culminating in a fistfight in the Waters parlor! The outcome of the fight is not recorded but the controversial south tower of the bridge, resting on the foundation endorsed by Lawson, remains stable 70 years later.

Waters loved to generate controversy and spirited discussions over the outcrops on field trips that he led. The trap was set when he led participants to an outcrop or roadcut where geologic relationships at first seemed confusing. Observations were followed by differing interpretations, some quite vigorous and egged on by Waters's provocative comments. Finally, the group was invited to step farther back, where the broader relationships in surrounding terrain were also visible and revealed the true explanation, sometimes surprisingly simple. He took much satisfaction in the discussions and their outcome, but especially in this pedagogic technique. The field trip was enlivened, and participants

learned not to reach conclusions too hastily while their noses were glued to the outcrop.

There were also times when even the most challenging geology did not induce discussions, to Waters's huge disappointment. One such time was a frigid November field trip along the Blue Ridge Mountains in northern Virginia: a strong wind drove sleet horizontally over the ridge crest and long icicles decorated the roadcuts. The Johns Hopkins grad students dutifully emerged from the warmth of the vehicles at each stop but huddled silent and shivering around the outcrops as Waters attempted to get discussions going. Exasperated, he finally exclaimed, "Trying to get any discussion out of you guys is like trying to pull teeth." Later, at the geology department Christmas party, where humorous gifts were exchanged, Aaron unwrapped a small but weighty package, gaily decorated, to find a shiny new pair of pliers. Attached was a gift card that read: "Trying to get any discussion out of you guys is like trying to pull teeth!" It remained a prized memento for years.

THE RETIREMENT YEARS, 1972-1991

Retirement from UCSC came in 1972 but with no letup in the pace of Professor Waters's professional activities. His university teaching continued, as did his geologic research. Most notable was the near-completion of his beloved long-term project on the geology of the Columbia River Gorge, separating Oregon and Washington (1973). He also lent his expertise to federal research organizations as a consultant in volcanology. Only in the last few years of his long and productive life did he finally slow down and go into true retirement.

Aaron Waters loved teaching; it was among the things he was born to do well, and the official act of passing into emeritus status did not change this part of his nature. It

did change his opportunities, allowing him to be more selective and to answer new challenges. He taught for a while longer at UCSC but then took teaching appointments at the California State University, Los Angeles, and at the University of Texas at El Paso, each appealing for different reasons. The geology department at California State, in a large metropolitan setting, scheduled many of its classes at night to enable working adults to pursue baccalaureate and masters degrees. The commitment of those students and their extra effort harmonized with his own philosophy. The setting of the University of Texas amid the wide-open spaces of West Texas, its congenial faculty and their commitment to improvement, were also appealing to Waters. Fortunately, he was able to teach his beloved petrogenesis course and lab at both places.

His final major research project, involving several summers of fieldwork during the 1970s, was instigated by the National Park Service. Lava Beds National Monument in northeastern California was a public attraction for both scientific and historical reasons. The park contains voluminous basaltic lava fields, cinder cones, and extensive lava-tube canyons on the northern flank of the Medicine Lake Highlands shield volcano. Part of this rugged terrain encompassed Captain Jacks Stronghold (1981), famous as the core of Indian resistance to U.S. troops during the Modoc War of 1872-1873. The extensive, highly complex system of lava-tube caves within the basaltic flows was obviously a feature of remarkable geologic and public interest, but had never been studied and the Park Service knew little about it. Aaron Waters rectified this deficiency. Still vigorous in his seventies and aided by field assistants Dave Kimbrough and Jamie Gardner, he produced a detailed map and cross-sections of much of the cave system—within ~ 20 square miles of flows—in several summers of fieldwork. This monu-

mental study, combined with surface mapping of the lava flows by Julie Donnelly-Nolan, finally appeared in 1990 as a *U.S. Geological Survey Bulletin*. As the most detailed study of a lava-tube cavern system ever published, it is a fitting capstone to Aaron Waters's long, productive, and distinguished research career.

Waters served also as a consultant in volcanology after retirement from UCSC. As an authority on the Columbia River Basalt, he consulted during the late 1970s for the Rockwell Hanford Corporation, which managed the Hanford, Washington, plutonium-producing facility (situated on the basalt) for the U. S. Department of Energy. He then joined the Geologic Division of Los Alamos National Laboratory as a consultant in late 1979. He was brought to LANL initially to add expertise on basalt studies on the Yucca Mountain nuclear repository project, but also collaborated with Fraser Goff on a lengthy report written to muster scientific and financial support for drilling five magma-hydrothermal systems under the emerging Continental Scientific Drilling Program (1980). The later successful drilling and borehole geophysical measurements at the Inyo Domes (Coso), Valles Caldera, Salton Sea, Geysers-Clear Lake, and Long Valley hydrothermal areas owed much to Waters's early efforts to get those projects launched. He served also as adviser to three successive Geologic Division leaders at LANL, and critically reviewed all outgoing reports and manuscripts.

Waters left LANL in 1983 and moved to Tacoma, Washington. There Aaron and Elizabeth Waters lived in retirement in full view of Mount Rainier and his beloved Cascade Mountains, until his death eight years later.

EPILOGUE

In retrospect, one looks back over Aaron Waters's career with profound admiration. He worked hard all his life, took satisfaction in what he did, and blazed new trails within the realm of geology. He was instinctively a leader, pursuing his goals with conviction and the spirit of adventure, never too concerned by the adverse views of others. His finest hour was as a professor, motivating his students by example, nudging them along with "tough love," and opening new vistas before them. His memory is revered by those who had the good luck to know him and to work alongside.

Many honors came his way, including a Guggenheim Fellowship (1937-1938), election to the National Academy of Sciences (1964) and the American Academy of Arts and Sciences (1966), and the Penrose Medal of the Geological Society of America (1982), its highest award. Those who knew Aaron well will perhaps agree that the honor he treasured most was his role in encouraging and nurturing so many fine young minds, and launching those young scientists upon their own successful geologic careers.

AARON AND ELIZABETH'S DAUGHTER, Susan Waters, provided important facts and recollections of his early years. Fraser Goff, Aaron's research colleague in the Geologic Division of Los Alamos National Laboratory as well as his grandnephew, provided a wealth of information concerning the Waters' "retirement" years (i.e., the post-1972 period not covered by his biobibliography). Their invaluable help, along with that of Don Swanson, is gratefully acknowledged. An earlier memorial by Konrad Krauskopf, Robert Garrison, and George Thompson provides insightful glimpses of Aaron in his roles as professor and as research geologist, including the passage quoted in this account (Krauskopf et al., 1992). Academicians John Crowell and William Dickinson asked me to write this memorial, provided later encouragement, and helped greatly in suggesting revisions.

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