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ELIOT BLACKWELDER

1880—1969

A Biographical Memoir by
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In 1936 ELIOT BLACKWELDER filled out a questionnaire sent to him by the Eugenics Record Office of the Carnegie Institution and by the Eugenics Society of America. The questionnaire was a long one, requesting data about his family back to his grandparents, especially regarding occupations, diseases, longevity, "special gifts or peculiarities of mind or body," and "character, favorite studies, and amusements." The fact that he would fill out such a form with scrupulous care betrays much about his character—his attention to detail, his willingness to give time and effort to a project that he thought might ultimately benefit society, and his conviction that social problems needed the application of science for their solution.

The document gives an intimate glimpse of a stalwart American family. Eliot's paternal grandparents came from North Carolina, but spent most of their lives on a farm in central Illinois. His father, leaving the farm early in life to take a position as county clerk, ultimately became a company executive in Chicago. His mother, daughter of a minister in upstate New York, went west to Kansas as a university student. All the family, according to the questionnaire, were people of substance—successful farmers, schoolteachers, ministers, businessmen, clubwomen. Most lived to a ripe old age, had large families, and suffered little from disease. They are described as kindly, generous, optimistic, and strong in their sense of duty and in the enforcement of discipline. They had lively intellectual interests, many of them especially in history and biography, and they took an active part in community affairs. Altogether it is an enviable eugenic background. When one finds that Eliot has put down after his own name in the questionnaire, "studious rather than sociable . . . interested in social and economic affairs, especially history," the influence of his forebears is clear.

The one trait that does not seem to fit this heritage is his fascination with science. He describes his father specifically as "not scientific," and of his mother he says only that she had "an early interest in natural history." Otherwise there is no mention of science in the document. Yet somehow this city-born son of a business executive and a prominent Chicago clubwoman developed at an early age what he described as "a liking for the out-of-doors, tennis, hunting, and an interest in sciences." The interest was so strong, even in boyhood, that he once assembled a collection of more than 6000 specimens of beetles and butterflies. By the age of fifteen his accomplishments in ornithology gained him membership in the American Ornithological Union. These interests in birds and insects remained strong throughout his life.

When he attended the University of Chicago at the turn of the century, however, the long-time family concern with history reasserted itself. From many courses in Latin and Greek came a great love of classical antiquity, and his first choice of a major subject was in this field. The interest in ancient Greece and Rome persisted in later life, giving him a reputation as an amateur classicist and providing him with a wealth of apt quotations from classical authors.

In his senior year at the university, he was wooed away from the classics by the inspired teaching of R. D. Salisbury, and his dedication to geology as a career was confirmed by two summer-long expeditions with Professor Salisbury to the Rocky Mountains shortly after graduation in 1901. These trips introduced him to the mountains and deserts of the American West, which were to become the focus of most of his professional work.

After two years of teaching geology at the University of Chicago, Blackwelder accepted an exciting invitation to accompany Bailey Willis on an expedition to China under the auspices of the Carnegie Institution of Washington. Together with a topographer, Harvey Sargent, he and Willis made their way to the Orient via Europe and Russia. During the numerous stopovers in Europe, including attendance at the International Geological Congress in Vienna, the young man established personal contact with many noted geologists. These contacts, several of which were to ripen into firm friendships, were the beginning of the wide circle of acquaintances that he maintained all over the world. After the sojourn in Europe, the three-man expedition had a long and memorable ride to China on the newly built Trans-Siberian Railroad. The route in China went from Peking to Tsingtao, then west to the ancient capital of Hsian in Shensi Province, south across the high Tsinling Range to Ichang on the Yangtze River, and down the Yangtze by boat to Shanghai. The expedition logged some 3000 miles by foot, pony, boat, and train. It made an indelible impression on young Blackwelder's mind, providing him with a rich background of personal and professional experience. Not only the geology, but also the lives and social institutions of the Chinese people, excited his sympathetic interest; and he followed the later political developments in China with sorrow and misgivings.

On his return to America, Blackwelder married Jean Bowersock, daughter of a prominent Kansas family, whom he had known from childhood. For several years he was on the faculty of the University of Wisconsin, becoming a full professor at the age of thirty, before obtaining his Ph.D. degree from Chicago in 1914. From 1916 to 1919 he served as head of the geology department at the University of Illinois. Then followed a brief period of apparent indecision. He went to Stanford University as a visiting professor, but left the same year to accept a position with the Argus Oil Company in Denver. After less than two years as a petroleum geologist, he returned to an academic post at Harvard, then in 1922 accepted an invitation from Stanford to succeed Bailey Willis as head of its geology department. This position he held for twenty-three years, until his retirement in 1945.

The move to Stanford was an important turning point in his career. Before that time he had spent most summers in field-work with the U.S. Geological Survey in the western states and Alaska, work that resulted in many descriptive papers on the mountains of Wyoming and the glacial geology of the Alaskan coast. From this long field experience, he also gained the background for more general papers on the geologic history of the continent and for some memorable shorter papers on specific geological topics. These latter papers, continually pointed out to students as models of clear geologic reasoning and exposition, include a variety of subjects: the geologic role of phosphorus; the interpretation of unconformities, the breaks in a sedimentary sequence that indicate times when the land was undergoing erosion; the origin of the Bighorn dolomite; and the effect of climate on the characteristics of continental sediments. In each article the author describes in simple, straightforward language the status of current thinking about subjects that at the time were highly controversial, carefully analyzes the semantic confusion that so often obscured the actual argument, marshals his observations from the field to support his preferred hypothesis, and then points out candidly the places where his ideas are weakest. The papers are not profound, but they represent a clarification of basic geologic thinking at a time when such clarification was sorely needed.

Blackwelder's breadth of interest, as indicated by titles of papers from this early period, seems extraordinary in our modern age of specialization. Geomorphology and sedimentation, then as later, were his major concerns, but he writes easily and well about fossils, climate, structural geology, Precambrian rocks, and phosphate deposits. In the early 1920s, when he evidently thought fleetingly of becoming a petroleum geologist, he wrote a paper on oil domes and another on oil movement. At the early age of thirty-one, he coauthored an elementary textbook, which combined physical and historical aspects of geology—a combination that is touted by publishers of some modern texts as a radical innovation in geology teaching. From a modern viewpoint the book seems curious, because it limits the discussion of igneous rocks, metamorphic rocks, volcanoes, and earthquakes to a few pages in the first chapter and concentrates on geomorphology and sedimentary rocks. The skewed emphasis suggests the direction of Blackwelder's interests, and the simple unadorned style with many carefully phrased definitions is revealing of his ideas about pedagogy.

The new base at Stanford after 1922 provided an opportunity for research in two directions that over the years became major lines of activity: the history of glaciation in the Sierra Nevada and the development of desert landscapes. At first in frequent brief abstracts, then in longer definitive papers, his bibliography records the progress of his thinking on these subjects.

In the Sierra Nevada, especially on its semiarid eastern side where the evidence of glaciation is not obscured by forests, he could distinguish the debris and erosional forms produced by three major advances of ice tongues down the steep valleys and the still older debris left on a few ridge crests from an earlier advance. A similar periodic waxing and waning of glacial activity during the Pleistocene had been established for the ice cap that once covered the central part of the continent, but Blackwelder faced the necessity of working out criteria for age assignments that would be applicable in the very different environment of mountain glaciers. Once the criteria had been developed and tested in the Sierra Nevada, he found them useful for studying glaciation in other ranges of the Great Basin and in the Rocky Mountains. Thus he could correlate glacial events over most of the West and, more tentatively, could suggest correlations with the better-known chronology of the midcontinent. The glacial story of the Sierra Nevada has been much refined since Blackwelder's work, but the major divisions he established remain the framework for more recent research.

The peculiarities of erosional and depositional processes in deserts have long fascinated geomorphologists, but Blackwelder's special gifts of keen observation and critical analysis proved particularly valuable for their study. Hardly an aspect of desert topography escaped his attention, but he is best known for four contributions: demonstrating the fallacy of the then-prevalent notion that much desert weathering is accomplished by diurnal temperature changes, clarifying the role of wind in shaping desert features, noting the importance of mudflow deposits in desert sediments, and emphasizing the distinction between broad erosional surfaces (pediments) and depositional surfaces (bajadas) as parts of desert plains.

Blackwelder's wide-ranging interests, although emphasizing mountain glaciation and desert processes, touched many other subjects during his years at Stanford. He pointed out the abundant, but far from obvious, evidence for Pleistocene lakes in many of the now-dry valleys of the Great Basin; demonstrated the recency of formation of the valley that the Colorado River has carved across Utah and Arizona; marshaled evidence for an impact origin of Meteor Crater; and showed that certain peculiar sedimentary rocks in many of the western mountains are best explained as formed from debris left by glaciers far back in geologic time. He wrote notes about earthquakes, landslides, and finds of vertebrate fossils. Occasionally, too, he contributed short papers summarizing and clarifying specific topics: exfoliation in rock weathering, the distinction between fault scarps and fault-line scarps, the anatomy of desert plains, and the insolation hypothesis of rock weathering. Like his earlier papers of this type, these have become classics in geologic literature, less for their originality or profundity than for the crystal clarity with which they illuminate subjects that previously had seemed bogged down in controversy.

Involvement in scientific work never completely overshadowed Blackwelder's deep concern for the welfare of society. During the 1930s, the long drawn-out depression and the increasingly ominous events in Europe occupied more and more of his thinking. When in 1940 he faced the problem of choosing a subject for his presidential address to the Geological Society of America, he abandoned geological topics for a subject that would enable him to express some of his social concerns, "Science and Human Prospects."

The address is an interesting document. One theme is a forceful expression of the old idea that education is the only "sure cure" for the ills of democracy. This is coupled with worry about the quality of teachers produced by schools of education, particularly about their meager training in science. The scientific method, he points out, is difficult to learn, and an appreciation for it is woefully lacking among the general populace. A prime goal of education should be to supply this lack. A widespread knowledge of science, or at least an understanding of its capabilities, is particularly important because science will increasingly be called on to solve social and political problems. Without the popular support for science that comes from recognition of its accomplishments, further social progress will be impossible. Many other species before *Homo sapiens*, he reminds his audience, have reached a limit in their development and then declined toward extinction; perhaps mankind, without an adequate understanding of science, has reached that sort of turning point. It is only in the last paragraphs, with a suggestion that humanity should take warning from the fate of its predecessors, that a geological theme emerges.

One hesitates to criticize an effort of this sort. There are many germs of truth in it, and much noble sentiment. If it sounds in places naive and simplistic, in view of the disillusioning experiences of the past thirty years, perhaps this is only the inevitable reaction of any generation to an expression of ideals and aspirations by the generation that came before. A scientist seldom has the courage to express his thoughts on such subjects to a large audience, and when he does he should be applauded rather than exposed to the captious comments of those with the great advantage of hindsight.

So disturbed was Dr. Blackwelder by the war and the uncertainties of the postwar world that after retirement, in 1945, he renounced geology in order to give his entire attention to efforts toward establishing a durable peace. For many years he played an active role in Atlantic Union, an organization whose goal was a political union of the principal democracies. During these years his only geologic activities were occasional attendance at meetings, publication of a few abstracts based on earlier work, and preparation of articles for guidebooks and symposium volumes. Among the latter, the two papers he contributed to the volume *Geology of Southern California* are notable as lucid summaries of his ideas on geomorphic processes in the desert and on Pleistocene lakes of southeastern California.

The last years of his life were made difficult by Parkinson's disease, a debilitating illness that slowly sapped his physical strength, while his mind remained alert and active. To the very end he retained an interest in national and international politics, in affairs of the university, in geologic organizations, and in the many kinds of birds that came to the feeder outside his bedroom window. For one so active in earlier life, it must have been galling in the extreme to lie helpless in bed while the months stretched into years. But there was never a word of complaint—only now and then a touch of rueful humor about his progressive incapacities. The Stoic philosophers, whose writings he had once admired, would have found him an apt disciple.

Dr. Blackwelder regarded himself as primarily a field geologist, and it was indeed by long and careful observation in the field that he made his great contributions to science. His special talents were those of a disciplined observer—the ability to see at once, almost intuitively, the essentials of a situation, to sort out the important from the unimportant, to relate one observation to another, to sense what additional observations would be needed in the field or laboratory. Beyond this was his capacity for clear, direct thinking and for expressing complex ideas in simple words. His genius was not to generate spectacular or revolutionary concepts, but patiently, unobtrusively, always with a keen eye for his own inadequacies, to bring order and good sense into disputed areas of science. Many of his discoveries seemed so difficult to make—then so simple and obvious once they were pointed out—the sort of discoveries that are taken up at once into the body of a science and quickly become textbook dogma, with their discoverer all but forgotten.

In teaching as well as research, Blackwelder's emphasis was always on accurate observation. Students fortunate enough to have worked with him will long remember his gentle insistence and their frustration at being told to examine a specimen repeatedly, even after they were sure they had seen all there was to see. And especially, they will remember the glow of satisfaction that came when they had finally spotted the missing detail and the dawning realization that they were being trained to see as they had never seen before.

To casual acquaintances Dr. Blackwelder often seemed reserved and a little austere, but at heart he was a kindly person, patient and helpful to students and attentive to the needs and wishes of colleagues. He was a man of principle, well disciplined himself and unhappy but not critical when those around him showed lack of discipline. Like his forebears, he believed firmly in the virtues of hard work and of striving to make the world a better place.

He was an active member of many societies and served as an officer in three: President (1921) of the Geology and Geography Section of the American Association for the Advancement of Science; Vice-President (1934 and 1939) and President (1940) of the Geological Society of America; and Vice-President (1945–1946) and President (1947–1949) of the Seismological Society. He was a member of the American Association of Geographers, the American Association of Petroleum Geologists, the Washington Academy of Science, and the California Academy of Science.

Honors came to him in abundance. He was a member of the National Academy of Sciences (elected in 1936) and an honorary member of the American Philosophical Society, the Geological Society of London, the Geological Society of Belgium, the German Geological Association, and the Geological Society of China.

Dr. Blackwelder survived his wife by nearly three years. The couple had celebrated their sixtieth wedding anniversary in 1964. Surviving Dr. Blackwelder at the time of his death were his brother Paul, of St. Louis, Missouri; seven children; sixteen grandchildren; and thirteen great-grandchildren. The children are: Dr. Richard Blackwelder, Professor of Zoology at Southern Illinois University; Justin Blackwelder of Washington, D.C.; Mrs. Margery Alden, Mrs. Trude Ball, Mrs. Lois Fuller, and Mrs. Ruth Lanz, all of Palo Alto, California; and Mrs. Martha Merk of Portola Valley, California.

Eliot Blackwelder will be remembered by all who knew him as a dedicated scientist and as a true "gentleman of the old school"—dignified, courteous, generous, always considerate of the views of others, never losing his basic humility despite the recognition and honors that came to him during a long and distinguished career.

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KEY TO ABBREVIATIONS

Am. J. Sci. = American Journal of Science
Bull. Am. Assoc. Pet. Geol. = Bulletin of the American Association of Petroleum Geologists
Bull. Geol. Soc. Am. = Bulletin of the Geological Society of America
Bull. Seismol. Soc. Am. = Bulletin of the Seismological Society of America
Bull. Utah Geol. Mineral. Surv. = Bulletin of the Utah Geological and Mineralogical Survey
Econ. Geol. = Economic Geology
Int. Geol. Congr. = International Geological Congress
J. Geol. = Journal of Geology
J. Wash. Acad. Sci. = Journal of the Washington Academy of Science
Pan-Am. Geol. = Pan-American Geologist
Proc. Geol. Soc. Am. = Proceedings of the Geological Society of America
U.S. Geol. Surv. Bull. = U.S. Geological Survey Bulletin

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