

Memorial to William E. Davies 1917-1990

DANIEL B. KRINSLEY
Washington, D.C.

The enthusiasm, ebullience, curiosity, competence, and dedication that so characterized Bill Davies melded to create an outstanding engineering geologist, explorer, speleologist, teacher, and public servant. The exciting adventures, productive achievements, and humorous incidents shared with Bill provide his numerous friends and colleagues with warmly nostalgic and treasured memories.

Bill Davies was born on Christmas Eve 1917 in Cleveland, Ohio, to William R. Davies and Florence (Koch) Davies. He and a younger brother, Jack, shared a close family relationship with many devoted aunts, uncles, and cousins. There were nearly weekly gatherings of the clan via travel on the rapid transit which sparked Bill's lifelong interest in railroads.

The Davies family moved to East Orange, New Jersey, when Bill was about 12 years old. Their house on Maple Avenue backed up to the commuter railroad tracks of the Delaware Lackawanna and Western Railroad, where Bill monitored the conversion of the line from steam to electricity. He read everything available about the D. & W. Railroad as well as the Pennsylvania and Baltimore and Ohio railroads. Later, in response to a high school (Carson Long Institute, New Bloomfield, Pennsylvania) assignment, Bill, his brother, and a friend, George Hicks, surveyed the dug but unfinished five tunnels of the proposed route of the Susquehanna River and Western Railroad between Harrisburg and Pittsburgh. This route would cut several hours off the running time of the Pennsylvania Railroad between the same two cities. That project was Bill's first engineering study, resulting in his first research paper. It was at this time that Bill met Frank Tressler, an attorney and amateur geologist who introduced him to the many outcrops of fossil beds in the Perry County, Pennsylvania, area. It was there also that Bill first visited and surveyed many caves.

The early convergence of Bill's interest in engineering and in geology led him naturally to the Massachusetts Institute of Technology, which he entered in 1935. Sharpening his skills in mathematics and in physics, he graduated in 1939 with a major in geology and a minor in geophysics. He then accepted a graduate assistantship in the geology department at Michigan State College. In addition to his departmental responsibilities, he was a summer field assistant with the Pennsylvania Geological Survey conducting geologic mapping in the south-central part of Pennsylvania. The geology department secretary at Michigan State College was a keen judge of character and introduced Bill to Geraldine Hall. After Bill received his M.S. in June 1941, the two were married in November 1941. Gerry became his lifelong partner, frequently accompanying him into the field and at his numerous international meetings. She appreciated his interests and his dedication, and she contributed substantively to his work.

Bill had entered the U.S. Army in July 1941 as a second lieutenant with the Corps of Engineers and was stationed at the Engineer Reproduction Plant at Fort McNair and later at the Army Map Service, both in the Washington, D.C., area. At the Map Research Department, he started with one assistant, and by August 1944 he was Captain Davies, Chief of the Ma



Research Department, with a staff of 70. They produced thousands of maps for strategic planning of ground and air operations, as well as handkerchief maps for pilots bailing out and for inclusion in loaves of bread for prisoners of war. Bill recalled delivering to the White House classified maps destined for Winston Churchill. When the war ended, Bill was a Major and later retired from the Army Reserves in 1963 as a lieutenant colonel. After leaving military service in 1946, Bill remained at the Army Map Service as a civilian in charge of gathering map intelligence data.

In May 1948, Bill left the Army Map Service and joined the West Virginia Geological Survey for an investigation of the caves and karst of West Virginia. The work was initiated primarily because of the interest at that time in the use of caves as defense shelters. Thomas W. Richards, then a student at Dickinson College, was Bill's field assistant during the summer of 1948, and related the following recollections of their work together.

Working from 7-1/2 minute quadrangles on which Bill had plotted all the limestone outcrops and known caves, they visited every outcrop they could, and queried farmers about the presence of any caves, sinkholes or pits. By summer's end, Bill had added approximately 150 new caves to the then-known inventory. They worked on the future publication *Caverns of West Virginia* during the week and moonlighted in Maryland on Saturdays and Sundays doing field work for the subsequent book, *Caves of Maryland. Caverns of West Virginia*, describing the caves of the state, their origin, and the features of the karst related to the caves, was published by the West Virginia Geological Survey in 1949. It became a bestseller, which has gone through three editions. *Caves of Maryland* was published in 1950.

Bill's long and productive career with the U.S. Geological Survey started in August 1949 when he was asked to join the Military Geology Branch by its perceptive chief, Frank Whitmore. That branch was largely funded by the Corps of Engineers, and Bill's expertise and familiarity with the engineering geology needs of the military were extremely valuable professional assets. In one of his early assignments, Bill was chosen as the site selector for the first underground installation in the United States, at Raven Rock (Camp Ritchie), Maryland. In June 1953, I accompanied Bill to Thule Air Force Base (Greenland), which at that time was being enlarged. Bill seized upon the availability of helicopters as a rare opportunity to extend the range of our work and to map an extensive region including offshore islands that previously had received only reconnaissance coverage. Byproducts of that work included a detailed report on the geology of this area published in Denmark in 1963 by the Meddelelser Om Gronland.

On March 19, 1954, Bill joined Justice William O. Douglas and two dozen other naturalists, conservationists, and newspaper editors for that memorable hike from Cumberland, Maryland, to Washington, D.C., along the 184 miles of the Chesapeake and Ohio Canal. In a misguided campaign to make the scenery along the Potomac River more accessible to the public, the *Washington Post* had suggested that a highway be constructed over much of the canal. Justice Douglas, in an eloquent plea, challenged the editors to get acquainted with the canal by hiking its length with him. The editors of the *Washington Post* had accepted the challenge, and after the hike they modified their support of a parkway. It was the start of Bill's love affair with the canal and of his close relationship with Justice Douglas. Almost all of the engineering geology concerning the canal's construction and its subsequent designation as a national park was mapped or assembled by Bill for the use of Justice Douglas in preparing the requisite legislation.

During the period 1954-1955, Bill sailed to Antarctica aboard the icebreaker U.S.S. *Atka* for the purpose of selecting sites suitable for U.S. research stations during the International Geophysical Year. His choices were based on his keen assessment of each site's purpose, its supply needs, and its proximity to its study subjects, whether they were penguins or large ice masses. The Davies Escarpment in Antarctica was named in honor of his work there.

Bill was appointed assistant chief of the Military Geology Branch in January 1955. In February 1956, Bill became chief of the Alaska Terrain and Permafrost Section of the Military Geology Branch. That group consisted of glacial geologists, geomorphologists, and botanists, several of whom had been students of Kirk Bryan at Harvard and who had conducted pioneering studies on the surficial and geomorphological implications of permafrost. Bill's stewardship provided guidance in utilization of the results of these research studies toward their application to engineering geologic problems. In addition to his administrative duties, Bill resumed his field studies in the ice-free land of northern Greenland. This work was done in cooperation with the U.S. Air Force for the purpose of establishing austere airfields with little or no construction effort. It was a unique opportunity to do detailed ground investigations of otherwise inaccessible regions and to combine engineering geology with observations of the glacial geology and geomorphology of areas that had been seen only from aerial photos.

In early June 1960, Bill crossed the Greenland Icecap by helicopter and joined a group that had established a base camp at Centrum Lake, northeast Greenland. Using two H-34 helicopters, the group conducted field work from the Centrum Lake base camp from June 14 to July 1, 1960. It was during this period that Bill discovered and explored the farthest north caves in Greenland, at 81°N. These caves, comparable in size to caves in the temperate zones, contained 12 levels in a vertical range of 1000 feet and are valuable indicators of glacial limits in northern Greenland. On July 2, 1960, with the two helicopters and a party of ten, Bill led an epic journey across northeast Greenland to Cape Morris Jesup, the northern tip of Greenland. On July 4, 1960, the party was the first to set foot on Coffee Club Island, an off-shore moraine and the northernmost land on Earth. Bedrock and unconsolidated materials were mapped, raised marine beaches were measured, and samples were collected, including shells for radiocarbon dating. Several published reports resulting from these investigations established, among other things, that Wisconsin glaciation covered all of northeastern Greenland with a continental ice sheet centered in central Greenland; withdrawal of the ice sheet resulted in marine submergence to a depth of 225 ft (68 m) about 5400 years ago.

In mid-July 1960, Bill and I did some detailed field work at a potential unprepared landing site at Bronland Fjord, Pearyland. Bill was the ideal field companion: considerate, generous, never complaining, and remarkably calm in emergencies. He was a bear for work, and his interest and curiosity always lured him to just one more outcrop.

The summer of 1960 was a vintage time for field work. After the challenges of Greenland, Bill flew to Alaska in late July to examine potential landing sites in the Aleutians and at Anaktuvuk Pass in the Brooks Range. In August 1960, he traveled to Finnmark, northern Norway, where he mapped the engineering geology of several austere landing sites for NATO. It was a far cry from uninhabited northern Greenland. The Lapps, colorfully clothed, were frequent visitors with their herds of reindeer.

From 1961 through 1966, Bill's summer field work was conducted in the Yukon-Tanana Upland of central Alaska. Using helicopters, Bill mapped the surficial and bedrock geology with engineering interpretation for construction and military operations. During the summer of 1967, he conducted engineering geology studies for the U.S. and Australian governments in the central deserts of Australia. After completion of that work, he transferred to the Engineering Geology Branch of the U.S. Geological Survey.

Bill's work then was primarily in the Appalachians, a region that had first elicited his interest in geology and which would continue to stimulate and challenge him. In late 1967, he made a study of the stability of coal refuse banks and tailings dams in cooperation with the U.S. Bureau of Mines. This was followed by a two-year effort to locate suitable sites for missile silos in bedrock east of the Mississippi River. In 1972, Bill was the engineering geologist assigned to investigate the Buffalo Creek, West Virginia, disaster, which involved the failure of a tailings

dam made of coal waste. The failure resulted in a 20–30-foot-high wave of water that rushed through a narrow valley, inundating 16 small communities with approximately 130 million gallons of water and coal-mine debris and killing 120 people. Bill was appointed by the Governor of West Virginia to a commission to investigate the disaster. The investigation, completed in 1973, resulted in the enactment of legislation to require regulations for critical elements of contemporary coal-mining procedures, especially the construction of coal-waste impoundments. Bill's 1967 studies had identified many coal-waste dumps, including the tailings dam at Buffalo Creek, that were vulnerable to failure. His report generally had been ignored. After the 1972 disaster, Bill was sought after for advice by several governmental agencies.

In 1975, he was asked by the Appropriations Committee of the House of Representatives to determine the cause of cost overruns and to evaluate the safety of Gathright Dam in Virginia. It was designed as a hydro-facility, and had been sited on karst. He was asked by the U.S. Department of Justice in 1977 to determine the safety and the practicality of the tailings dams proposed by the Reserve Mining Company, to abate pollution of Lake Superior. That same year, he investigated for the Corps of Engineers the failure of the Kelly Barnes Dam at Toccoa, Georgia.

Bill's work on the slope stability of the Appalachians was greatly aided by one of his many dedicated and devoted assistants, Greg Ohlmacher, who worked with Bill from 1975 to 1983. Greg reported that Bill, instead of stopping at the boundaries defined by the Appalachian Regional Commission, decided to extend the mapping in order to complete all of the pertinent 2" sheets. That part of the project was completed as a series of 7-1/2 minute U.S. Geological Survey open-file maps. Bill was a major contributor to the *Landslide Overview Map of the Conterminous United States*, scale 1:7,500,000, which was published in 1983. In all, he completed an amazing 1539 maps showing landslides and landslide susceptibility in Pennsylvania, Ohio, and West Virginia. He involved many college undergraduates as interns in drafting and compiling the final landslide maps, and he also took many of these students on short field trips in order that they would understand and appreciate what was involved in the work. In 1980, Bill was assigned to the Geological Survey of Indonesia, through the Agency for International Development, to train engineering geologists and to participate in landslide studies in Java and Sumatra.

Bill read and collected books voraciously. His library was one of the best private collections in Washington, D.C.

His bibliography contains more than 200 titles, which embrace most aspects of geology, especially engineering geology, geomorphology, glacial geology, and speleology and attest to the breadth and scope of his accomplishments. In addition to these, there are also 50 military geology publications that have security classification and are not listed. He delivered hundreds of lectures in his well-organized and dynamic style, and guided numerous field trips for aspiring geologists.

Bill received the Antarctic Medal for his outstanding work in that continent in 1954–1955. He was a Fellow of the Geological Society of America, the Arctic Institute of North America, the Explorers Club, and the American Association for the Advancement of Science. He was a member of the Geological Society of Washington, the Association of Engineering Geologists, and the Virginia Academy of Sciences, and he was president of the National Speleological Society (1954–1956).

No less astonishing than the multiplicity of his professional work efforts and the published results of a prolific scientist was Bill's unsparing dedication to a host of civic causes that required his expertise and that he embraced with vigor, leadership, and inspiration. Bill represented Falls Church on the Northern Virginia Regional Park Authority for 30 years; he was appointed to the Cave Board of Virginia by Governors Robb and Wilder; and with regard to the C and O Canal, he was the *ex officio* chief engineer for the National Park Service, and a charter member of the C and O Canal Association, of which he had been an officer or on the Board of

Whether it was Thule, Copenhagen, or Djakarta, Bill's warmth and personality elicited intense admiration. He had an extensive circle of friends who looked forward to hosting him and Gerry on their numerous travels to international meetings or on exotic field trips. He was generous of his time and efforts with friends and organizations, and whatever he did, he did well.

When Bill retired from the U.S. Geological Survey in July 1983, his career reflected merely a change in direction and emphasis. He continued the work of completing many of his geologic maps and reports, but used more time for his other pursuits. Chief among these was his intense interest in the C and O Canal, particularly the geology displayed along the canal and the engineering features on and adjacent to it. Not content with having mapped every one of its 184 miles on foot, frequently accompanied by Gerry, Bill reviewed all of the archival and library material concerning the canal. Bill was preparing a guide to the engineering and geology of the C and O Canal, a detailed history of the canal with emphasis on the engineering aspects, and an annotated bibliography of more than 1000 publications pertaining to the canal. On Saturday, June 23, 1990, Bill led a Smithsonian tour of his beloved canal; three days later, quite unexpectedly, he departed on his last great journey.

Those of us who were fortunate to share his tent, his office, or his council will cherish those memories. Aspiring engineering geologists can marvel and read from his impressive bibliography, which attests to the scope of Bill's contributions to his profession.

His loving family includes his wife, Geraldine H. Davies; a daughter, Pamela G. Davies; his son, William H. Davies; a brother, John A. Davies; and a new grandson, Drew William Davies.

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