

Memorial to Douglas Whiting Rankin 1931–2015

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Douglas W. Rankin, a distinguished scientist with the U.S. Geological Survey (USGS) and specialist in northern and southern Appalachian geology, died of respiratory failure 25 February 2015 in Washington, D.C., following complications from pneumonia. He was 83 years old. His career spanned five decades (1962–1995) of continuous and productive service for the USGS, first as a geologist, editor, leader, and branch chief (from 1978 to 1980) of the Eastern Region, and later as an emeritus scientist and renowned synthesist of Appalachian and New England geology (1995–2015).



Doug was born on 9 September 1931 in Newark, Delaware, into a working-class family whose passions included recreational hiking and camping in the White Mountains of New Hampshire. It was there that Doug acquired an early interest in geology and a love of outdoor adventure. Later, while serving on the trail crew of the Appalachian Mountain Club, he met another young member of the trail crew—Mary Backus (Rankin)—and together they developed a shared love of New England geology that lasted a lifetime.

Doug received his undergraduate education at Colgate University, where he earned a Bachelor of Arts degree with honors (Phi Beta Kappa) in geology in 1953. Later that same year, he enrolled in the graduate Geology Program at Harvard University, where he excelled in mineralogy and petrology as a student of Professors Cornelius Hurlbut and J.B. Thompson Jr., and undertook a Ph.D. thesis under the supervision of Professors Marland P. Billings and Thompson. Because of his interest in igneous petrology and field work in general, with the advice of Billings and Thompson, Doug chose for his Ph.D. a study of the low-grade rhyolites and granites of Piscataquis county, northern Maine, which were part of a larger igneous complex not yet fully understood. For the next four years, and briefly as a geologist with the Maine Geological Survey, Doug toiled in the rugged mountains of Baxter State Park and environs, where his meticulous mapping and petrologic observations, as well as dedication and perseverance, contributed significantly to the understanding of the Acadian orogeny. Early in this period of field work, he discovered crucial new plant fossils of Lower Devonian age—fragments of rare psilophytes (Dorf and Rankin, 1962)—in the Trout Valley Formation, which he mapped as overlying the Traveler Rhyolite. A little later, he correctly deciphered the setting of the Katahdin batholith, and its coeval carapace of volcanic strata (Traveler Rhyolite), which comprise a volcanic-plutonic magmatic arc of Early Devonian age (Rankin, 1968). These were bold new ideas for New England geologists, but Doug's observations and deductions were sound, and the impact of his work had immediate traction. During this same period, he developed contacts with the newly

developing USGS authorities on ash-flow tuffs, R.L. (Bob) Smith and R.A. (Roy) Bailey, and became the leading student of this subject within the Appalachian Mountain Belt. Results of his close collaboration with geologists and paleontologists working in the region, most notably R.B. Neuman and A.J. Boucot, were experienced first-hand by one of us on the 1966 New England Intercollegiate Geologic Conference (NEIGC) Excursions, and were much later featured in *A Guide to the Geology of Baxter State Park* (2010).

After his graduation from Harvard (1961), Doug accepted a position in the newly formed Department of Geology at Vanderbilt University, where he taught courses in mineralogy and petrology and inspired a new generation of students to field work, including a future Penrose Medalist (Robert D. Hatcher Jr., 2006). Hatcher considers Rankin's teaching in those years to be crucial to his own development and considers all his ~65 graduate students to be Rankin "grandstudents."

In the early 1960s, the USGS began an ambitious program to map the geology of the central and southern Appalachians and to understand its geology and mineral resources within the nascent paradigm of plate tectonics. Doug jumped at the opportunity for full-time research, and in 1962, he joined the USGS for what would become 53 years of nearly uninterrupted service to our nation and to science. From 1962 to 1975 he led or co-led a succession of USGS projects within the crystalline rocks of the Piedmont and Blue Ridge, near the common corner of Virginia, North Carolina, and Tennessee, that forever changed concepts of Appalachian tectonics and global geology in general: (1) Through his mapping of the Chilhowee Group and underlying strata, he described a major Precambrian volcanic complex in the vicinity of Mount Rogers, Virginia, and recognized that its upper part consists of extensive glaciogenic deposits. This work, and the age he determined with later U-Pb geochronology, proved that North America experienced profound glaciations in the late Neoproterozoic. It was a far-reaching discovery that was later cited as evidence of a "Snowball Earth" and a Cryogenian interval of geologic time. (2) Combining field and geochemical relationships with petrologic insight, he correctly surmised the consanguinity of gabbro and alkali granite across the Blue Ridge in the Crossnore Plutonic-Volcanic Group, and ascribed their genesis to Late Precambrian rifting of ancestral North America. This, too, was a ground-breaking advance that offered an explanation for the promontories and recesses of the Appalachian orogen and a contextual framework for the concept of a proto-Atlantic ocean (Iapetus). (3) Through bedrock mapping with G.H. Espenshade in the Winston-Salem 1° × 2° sheet, he recognized a major difference in rock types and associations across the extension of the Fries Fault in Virginia, later mapped as the Hayesville Fault by Hatcher (19781), that signified a major boundary between terranes of North American and African origin. With this work, the concepts of geologic terranes, and an allochthonous origin of the Inner Piedmont, were born, and early geodynamic modelling of the Appalachian Orogen was under way.

Doug's subsequent years at the USGS brought new changes of venue and new responsibilities but no decrease in productivity. In 1970, he and Ben Morgan completed a study of the thermally metamorphosed rocks of the Mount Morrison roof pendant in the central Sierra Nevada, California; from 1972 to 1973 he was a science advisor to NASA in the Lunar Sample Office, Washington, D.C.; from 1975 to 1980 he served multiple posts in the USGS, including project chief of the first Appalachian Volcanic Rock Project (1975–1980); coordinator of the Charleston, South Carolina, Reactor Environmental Safety Program (1975–1978); senior geologist with J.C. Antweiler of the Absaroka Wilderness Program (1975–1978); and from 1978 to 1980, as branch chief of the Eastern Environmental Geology Team.

Doug's last official work with the USGS was as project chief and senior scientist and volcanologist for several teams. These were to remap the bedrock of the U.S. Virgin Islands (1983

¹Hatcher, R.D., Jr., 1978, Tectonics of the western Piedmont and Blue Ridge, Southern Appalachians; review and speculation: *American Journal of Science*, v. 278, p. 276–304, doi:10.2475/ajs.278.3.276.

–1989) with a modern perspective, to compile and interpret all data related to igneous rocks of the Appalachian Orogen (1984–1989), and to evaluate the suitability of the Yucca Mountain nuclear repository site in the southern Basin and Range (1989–1990). The first two projects, in particular, represented an ambitious commitment to compile the work of federal, state, academic, and industry geologists throughout the eastern United States, including its continental margin. This resulted in Doug’s influential contributions to the Appalachian and Precambrian volumes of GSA’s celebratory series, Decade of North American Geology (DNAG). The full-color maps and correlation charts that accompany these volumes represent major, thought-provoking contributions that illustrate Doug’s ability to bring together ideas from domestic and foreign scientists, to compile vast amounts of information with creativity and freshness, and to engage both scientifically and personally with investigators from all realms of geoscience. Despite the long hours of office work, he continued to find joy in travel and outdoor adventure, best exemplified by his ascent of Mount Kilimanjaro (19,341 ft.) at the age of 65!

Following his retirement in 1995, Doug turned his attention back to the northern Appalachians and geological problems that had vexed him for decades. Two problems in particular intrigued him: the significance of mafic igneous complexes and related dikes along the Upper Connecticut River Valley; and the validity of a proposed soft-sediment allochthon of Early Devonian age in New Hampshire and neighboring Quebec. Notably, these were in the same region as the most famous work of his mentor, Marland Billings. He addressed both of them in a series of NEIGC field guides and journal articles that sought to clarify key relationships rather than dictate solutions. Throughout this period, he persevered with field observations, wounded with injury to his heart and legs, and determined to complete his life’s work with grace and dignity. Perhaps his best-known work of this time include his contributions to the Bedrock Geologic Map of Vermont (2012), a synthesis of Silurian rifting in basin formation in the Upper Connecticut Valley, and the first lithotectonic map of the North American Appalachian Orogen, which, in 2013, received the award as the Outstanding Publication by the Structural Geology and Tectonics Division of the Geological Society of America. His crucial and detailed evaluation related to the allochthon question in northern New Hampshire, complete with color maps and new geochronology, appeared in 2013. Additional geochronology based on collections of volcanic and intrusive rocks in New Hampshire that year were reported posthumously at a symposium in Doug’s honor at the meeting of the Northeastern Section of the GSA in March 2015.

Throughout his career and into retirement, Doug was widely respected and admired for his judgment, dedication, good humor, and professionalism. He was a Fellow (1966) and recent Foundation Trustee of the Geological Society of America; Fellow of the Mineralogical Society of America (1988); member of the American Association for the Advancement of Science, the Cosmos Club of Washington, D.C., and the American Geophysical Union, in which he served a tour as associate editor of *Tectonics*. He is survived by his wife of 59 years, Mary Louise Backus Rankin (herself an accomplished scholar and book author on the social history of China in the late nineteenth and early twentieth centuries), his daughters (Andie and Kathy), and four grandchildren.

This magnanimous and prophetic quotation (below) from Doug, published in the opening paragraph of one of his seminal contributions to Appalachian geology, is a fitting reminder of the character, intellect, and integrity that guided the work of Douglas Whiting Rankin, a giant in the pantheon of Appalachian geologists.

It is with some pause that I publish, in a volume dedicated to John Rodgers, a general article on the mountain system and the part of that system in which Rodgers made his first major contributions..... I can only hope that I will do it justice and that he will approve of the approach if not the conclusions.

—D.W. Rankin, 1975

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