

Memorial to Philip B. King 1903-1987

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Philip B. King will be remembered for his monumental contributions to the geology of west Texas, which he helped to make one of the classical regions in North American geology, and for his pioneering and long-continued achievements in the theory and practice of preparing tectonic maps of nations and continents. He combined rigorous standards for geological field work and for drawing conclusions from that work with a remarkable ability to build from such conclusions to syntheses of whole orogenic belts and of the continent of North America. He has left us an extraordinary legacy, both of thorough regional monographs and of synthetic maps, explanatory texts, and books. Few geologists since N. H. Darton, whom King so much admired, have made major contributions to geology in so many different parts of the United States, and, indeed, for the country as a whole.



Philip King was born on September 24, 1903, in Richmond, Indiana, his father's and grandfather's home town. At that time, his father, Irving King, was a graduate student at the University of Chicago. He was working with John Dewey and beginning a teaching career in education and child psychology that in a few years led him to the State University of Iowa in Iowa City, where Philip and his two brothers grew up and went to college.

After receiving the bachelor's degree in 1924, Phil went to work for the Marland Oil Company in what is now called the Permian Basin of west Texas, and he quickly became fascinated with the geology there. (He even prepared, for himself, a 27-page manuscript report on one piece of work and illustrated it with 11 drawings that already prefigured his mature style.) After a year with the oil company, he became an instructor at the University of Texas and started field work for the Texas Bureau of Economic Geology in the Glass Mountains, which are underlain by a richly fossiliferous Permian succession; he used part of that work to earn a master's degree from the University of Iowa in 1927. His brother Robert, who graduated in 1926, joined him in this field work. When Professor Schuchert of Yale, searching for more knowledge of Permian paleogeography to improve his famous and ongoing maps, discovered the two young men working in the Glass Mountains, he encouraged them with financial support and urged them to come to Yale for doctoral work. They did so, and were awarded their Ph.D. degrees in 1929, producing between them a major monograph on the Permian of the Glass Mountains.

After completing graduate work, Robert King went into the petroleum industry and became an expert on the geology of sedimentary basins in northern South America and Mexico, and later in many other parts of the world. Within the Geological Society of America, we remember him also as our highly efficient treasurer from 1964 to 1972. Philip, however, continued to work in west Texas. For one year he was an instructor in geology at the University of Arizona; he then spent the rest of his life as a geologist with the United States Geological Survey. It was N. H. Darton, charged by the Survey with helping to prepare a geological map of the state of Texas, who recruited King to the Survey in order to get material for that map on the then poorly known

Marathon region. The Survey kept King working in west Texas, first in the Marathon uplift, then in the southern Guadalupe Mountains, then in the Sierra Diablo and adjacent areas. For each of these areas he turned out major professional papers, classics not only in Texas geology but generally, because of their clear and astute discussions of stratigraphy and facies changes, organic reefs and their petroleum potential, and tectonic structure.

Some of these reports—for example, the Sierra Diablo Professional Paper—were delayed for decades as other work, notably war work, took priority. But King never wavered in his determination to produce and publish full reports on all the work he had done. I remember that, while I was his assistant in the early 1940s, parts of his evenings were devoted to putting the Sierra Diablo report into apple-pie order and publishable form, so that it could be laid aside indefinitely (20-odd years, as it turned out) and yet not be lost.

King had extraordinary ability as a draftsman—nay, as an artist. He had taken a minor in art in college and apparently was in some doubt then whether to go into art or geology. He chose geology, but his artistic temperament and ability remained with him. All his major reports and books are illustrated by his own superb drawings, some of them large-scale scenes of landscapes that bear comparison with the best in geological literature, such as the famous Holmes drawings of the Grand Canyon. The precision and yet beauty of these drawings and of his more ordinary drafting are admirable and help to characterize his work, in which everything contributed to clarity, order, and breadth of vision.

As the Great Depression deepened in the mid-1930s, the U.S. Geological Survey found it necessary to curtail and shift operations, and King was assigned to a project on clay in the Coastal Plain of Texas. Although he at first thought the project uninteresting, he plowed into it and soon found significant problems to investigate. Characteristically, he prepared a solid report on the project, and what might have been a ho-hum potboiler turned out to be a small but worthwhile contribution.

As the Second World War began in Europe, the U.S. Geological Survey geared up for a concerted search for “strategic minerals”: minerals that were or might soon be in short supply because of the war. King was assigned to the search for manganese deposits in the southeastern states, specifically at the edge of the Blue Ridge province in northern Virginia and later in northeastern Tennessee. As he put it, “We’re looking for ores and rumors of ores.” I was assigned as his field assistant in Virginia and later transferred with him to Tennessee, and I thus had the invaluable experience of working closely with a master field geologist and geological thinker. The economic value of the work we were doing was never forgotten, but King never forgot the “pure” scientific value either; our job was to understand the geology in all its aspects and to record it, in keeping with his high standards of accuracy. Useful reports were quickly prepared, yet they did not neglect the basic geology and the overall tectonics; after the war, King went back and reworked the material into thorough Professional Papers. The Professional Paper on northeasternmost Tennessee, co-written with Herman Ferguson, is another classic; the “bacon-strip” serial cross sections that King drew of the area are among the finest illustrations of geologic structure available.

Later in the war, the U.S. Geological Survey drew more and more of us into the more directly war-relevant work of the Military Geology Unit. In view of King’s well-known artistic ability, he was brought in to prepare terrain diagrams to illustrate the terrains and problems that invading troops would encounter. King took to the work with gusto and indeed developed the terrain diagram well beyond what it had been, into an art form almost, first for the Philippine Islands and then for other regions with which the Armed Forces were concerned. Most of these diagrams were never published, but those of us who saw them and worked with them can testify to the combination of accuracy and broad understanding of the terrains that they displayed.

When the war was over, King chose to return to east Tennessee and study the geology of the

Great Smoky Mountains. This proved to be a longer term project than anticipated, but as always it culminated in a series of reports, clearly written and admirably illustrated: in this case, not only professional reports but also descriptions of the landscape and geology for the layman, the casual park visitor.

In rehearsing the sequence of monumental regional reports that King produced, from the Glass Mountains to the Great Smokies, I have deliberately passed by his ability to generalize over and beyond the conclusions concerning individual regions. This ability appeared at the beginning of his career. In 1932, when the U.S. Geological Survey was preparing a series of field-trip guidebooks for the International Geological Congress of 1933, King was chosen to prepare an outline of the structural geology of the United States. His work was published as one of the guidebooks and was accompanied by what must be counted as one of the two earliest tectonic maps of any country; the other is the tectonic map of the USSR published by Arkhangel'skiy and Shatskiy at about the same time. The clarity with which King summarized the tectonics of the United States in 57 pages and a small map is extraordinary; for example, this guidebook contains what I believe is the first clear statement of the sharp contrast between the basement-cored uplifts of the Colorado, Wyoming, and southwestern Montana Rockies and the fold-and-thrust belt extending south from the Canadian Rockies through western Montana, eastern Idaho, the western edge of Wyoming, central Utah, and into southern Nevada.

During the 1920s, the Committee on Tectonics of the National Research Council decided to prepare a large-scale tectonic map of the United States; the project got under way only in the later 1930s, however, and the final compilation of the materials assembled for the map was entrusted to King. The map was published by the American Association of Petroleum Geologists in 1944, while World War II was still on; thus, King completed this major project at the same time that he was doing the work and writing the reports for the strategic mineral projects mentioned above.

After the war, King continued to think broadly about the regional geology and tectonics of the United States and indeed of North America in general. I remember well the immense rolls of paper on which he drew tectonic maps of the central and southern Appalachians at the scale of 1:1,000,000: "King-size" maps we used to call them. He also conceived the idea of writing a book on the tectonics of the United States, and he went to work on it during the years of the Great Smoky Mountains project. Soon his plan expanded to cover much of southeastern Canada, whose geology he felt could not be separated from that of the eastern States, and of northern Mexico, for which he had prepared a tectonic map already in 1942. Half the projected book was published in 1951 by the Princeton University Press as *The Tectonics of Middle North America (Part I)*, replete with the characteristic King illustrations, but he then laid the project aside for a while.

From 1954 to 1956, he was invited to be a visiting professor at the University of California at Los Angeles. Instead of simply completing the second part of the original project, he now expanded it to cover the whole of North America, and he rewrote it from scratch. The result was *The Evolution of North America*, certainly the best description of the geology of North America ever written by one person. Again, it was illustrated by King himself, except that the little scenic vignettes at the heads of the chapters were drawn by his daughter, Gertrude King Reagan, herself an able artist and scientific illustrator. The book appeared in 1959, on the eve of the plate-tectonic revolution in geology; yet so clear and correct was King's understanding that, when he prepared the revised edition (published in 1977), the new ideas could be incorporated into the text with little difficulty and no changes of plan or emphasis.

After the interlude in Los Angeles, King moved to the U.S. Geological Survey office in Menlo Park, near Stanford (previously, his base had been in Washington), and soon he was deep in Cordilleran geology and "neo-tectonics," a concept that the Soviet geologists were then establishing. He prepared a summary of Quaternary tectonics in the United States and adjacent regions for the 1965 volume on the Quaternary geology of the United States; he also summarized

the geology of California and took part in preparing a geologic map of Oregon. He was also involved in another project: a tectonic map for the whole of North America, called for by the International Subcommittee for the Tectonic Map of the World. That map appeared in 1969 and is certainly one of the most important of King's many contributions to geology. Characteristically, King was not content simply to produce the map; he also prepared a 95-page explanatory text, published (as was the map) by the U.S. Geological Survey.

The Survey had been aware for several years that the geologic map of the United States prepared for the International Geological Congress (IGC) of 1933 was obsolete; consequently, the country was poorly represented in international exhibitions of geologic maps at IGCs and other international meetings. They turned to King, now approaching retirement, to prepare a new map. He set to work, and with the stalwart assistance of Helen M. Beikman, the map was completed and published in 1974. This time, King prepared not just one but a whole series of Professional Papers to explain the units shown on the map and to make clear the principles on which it was drawn.

Although he retired from the Survey officially in 1973, King continued to work there until the end of the decade. In the 1960s he began to travel extensively abroad, for he was recognized everywhere as a master in the art of creating regional geologic, and above all tectonic, maps. He was invited to many international meetings, especially those concerned with such maps. Honors came his way; in 1965 he was awarded the Penrose Medal of our Society and also the Lomonosov Prize of the Moscow State University, and in 1966 he was elected a Fellow of the American Academy of Arts and Sciences.

In 1976, during a field trip in Australia, a trick knee that had given him considerable trouble for decades precipitated a serious fall, and after a few more years he was confined to his home in California. Even there he kept on working, "pecking at the typewriter" to turn out reports and his memoirs, and reading voraciously. He died on April 25, 1987, at 83 years of age. He is survived by his wife, Helen Carter King, whom he married in Washington in 1932 where she was already an established poet; his daughter, Gertrude King Reagan; and two grandsons.

Philip King was a driver; he drove himself and those who worked with him. Reactions to his strong personality were apt to be strong; he tended to inspire great admiration or great antipathy, and he too had his great admirations and dislikes. One person he admired was N. H. Darton, who first enticed King into the U.S. Geological Survey and then supported him firmly in his west Texas work. Perhaps Darton, called upon to prepare a guidebook on the structural geology of the United States for the 1933 Congress (he would have been the logical choice), turned the project over to King, with the valuable results already mentioned. I feel sure that Darton was a model for King throughout his career (as King has been for me). When Darton died, King prepared a memorial for the Geological Society of America that is a classic in its own right; 25 pages long—several times the limit then imposed by the Society on memorials—it presents so clear and forceful an account of a great geologist that the GSA broke its own rules and published it in its entirety.

Another figure is William Morris Davis, whom King met in the late 1920s, at a time when Davis was coming to terms with arid geomorphology, with which he had hitherto been little acquainted. King has told me how he admired this eminent geologist's ability, late in his career, to change his opinions radically on such matters as pediments, because he recognized the significance of evidence he had not before encountered. Davis's ability as a draftsman and an artist must also have impressed King. In the early 1960s, King put in order his own notes and drawings from Davis's lectures at Texas, 35 years earlier, and deposited copies in USGS libraries, where various geomorphologists discovered and used them. In the late 1970s, now 50 years later, King and Stanley Schumm edited and annotated those notes, adding many of Davis's classic published diagrams; the resulting book was published in 1980. King's total product of reports and maps is remarkable, not only for volume but for quality; in the accompanying bibliography, I have tried to

list only the really significant items out of a list of 140, and I cannot reduce it below 36. When we were working on the northeast Tennessee manganese report during World War II (I was the very junior author), the rest of us watched with awe as he "turned out copy like a mimeograph machine"; yet what he wrote was not padded or repetitive but beautifully organized and well written, and of course, superbly illustrated with his own drafting. These characteristics are present throughout his work; they increase its value and its influence even beyond its basic value as documentation and synthesis. Truly Philip King has left his monument behind him.

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* Curiously, the first bibliographic item attributed to P. B. King, an abstract of a paper he gave to the Iowa Academy of Sciences in 1924, was rewritten, if not actually composed, by C. R. Keyes for publication in his *Pan American Geologist*; Keyes even garbled the title, changing North to South Dakota! King's abstract, which is totally different, was published in the *Proceedings of the Iowa Academy of Sciences* a year or so later.