

# Memorial to Benjamin B. Cox

## 1898–1986

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Benjamin Burton Cox, polymath and perfectionist, was a geologist who gave his professional life to improving the art of oil finding. He died without warning or pain while breakfasting on August 12, 1986.

Ben was born into a long-lived Quaker family on February 25, 1898, in Greenville, Ohio, but was brought up in Indiana and educated at Rushville in that state, graduating with honors in 1916 from Rushville High School.

From Rushville, Ben went to the University of Chicago, his interest then tending to architecture. At Chicago he came under the influence of two men to whom he remained devoted: Thomas C. Chamberlin and Rollin D. Salisbury. They imparted to Ben a lifelong passion for geology, an interest later to be narrowed and intensified when, as a graduate teaching assistant, he worked with A. C. Trowbridge at the State University of Iowa and became fascinated by the manifold problems of sedimentology.

Ben took his B.S. and M.S. degrees at Chicago, the first with honors in geology and mathematics in 1921, and the second in 1922, with honors in geology and paleontology. He was elected to Sigma Xi.

After Chicago, Ben spent more than two years at Iowa working toward his Ph.D. under Trowbridge, his research being concerned with problems in sedimentation. Financial pressures led him to leave Iowa in 1925 with the degree incomplete, and although in 1928–1929 he attended Columbia University for a credit course in micropaleontology, Ben never found time to complete a Ph.D. dissertation that met his own rigorous standards.

In 1925, on the recommendation of Trowbridge, the Palmer Corporation of Shreveport, Louisiana, offered Ben a job as chief subsurface geologist. Ben's experience with Palmer served to confirm and amplify his already high interest in oil-related sedimentological problems. In 1927, primarily because of a desire to bring his income into better accord with the needs of a growing family, Ben decided to "go foreign," joining the Turkish (Iraq) Petroleum Company, headquartered in Baghdad, as a geological engineer.

Ben spent his next eight years in intimate contact with Iraqi and Middle Eastern exploration and production activities, first with the company he had joined and then with the Near East Development Corporation, which, from its head office in New York, monitored the considerable American investment in Iraqi oil. Ben was particularly proud of the fact that during this period he made the first accurate contour maps of the structures of many now-famous Iraqi oil fields, as well as establishing the final location of Baba Gurgur No. 1, the discovery well of the Kirkuk oil field.

Ben was now recognized as an American authority on Middle Eastern oil production and supplied the official statistics for that region to the American Institute of Mining and Metallurgical Engineers from their inception in 1934 through 1942. His knowledge of the Middle East was further recognized in 1935 when Socony-Vacuum Oil Company, itself a part-owner of the Near East Development Corporation, offered him the job of chief of Middle East production. In his new position, Ben also continued to give technical advice to the board of Near East Development



Corporation, while extending the geographic range of his oil interests by trouble-shooting for Socony-Vacuum on production problems in foreign areas other than the Middle East. As his range broadened, Ben evaluated Socony-Vacuum properties in Colombia (1936), surveyed Egypt's oil potential from the air and on the ground (1938), and spent six months in Venezuela (1939) organizing exploration for Socony-Vacuum Oil Company, Central America.

When America entered the war in 1941, Ben immediately sought active duty (he had seen service in 1918 in the Student Army Training Corps). He was rewarded with the rank of major in the Army Air Forces and the command of the Desert and Tropic Sections of the Arctic, Desert and Tropic Information Center. Ben's task was to provide technical data that would help the Army Air Forces operate more effectively. It was typical of him that he recognized immediately the eminent desirability of desalting sea water to relieve the thirst of pilots ditching at sea. Although leaders of the Army Air Forces were not interested initially, Ben, by the subterfuge of inducing the Royal Air Force to adopt zeolite briquettes first, caused the Army Air Forces to follow suit.

Although Ben had published little beyond Middle Eastern production statistics, his intimate knowledge of oil-related geological problems and his proposed methods of solving them were always enthusiastically, indeed uninhibitedly, imparted to his wide circle of colleagues and friends. This circle included Kenneth C. Heald, formerly a professor of geology at Yale, with whom Ben worked as a committee member when Heald was chairman of the American Petroleum Institute's advisory committee for Project 4, "Origin and Environment of Source Sediments of Petroleum." In November 1940, when this project was drawing to a close, Ben took over its chairmanship. After winding up Project 4, he developed research proposals for a new project designed to elucidate the origin of petroleum. The new project was approved in 1942 as Project 43, "Transformation of Organic Material into Petroleum." Ben's selection as chairman of its advisory committee was inevitable, for he had made outstanding contributions as a midwife at the project's birth and key definer of its scientific merit.

Heald, now the top exploration executive of the Gulf Oil Corporation in Pittsburgh, Pennsylvania, was impressed by Ben's accumulated knowledge and boundless enthusiasm for geological research related to finding and producing oil. In 1945, Heald offered him the directorship of a new Geology Division to be set up within Gulf Research & Development Company in Harmarville, Pennsylvania. Heald also prevailed upon Ben to commit to paper his ideas on the geological factors involved in the transformation of organic material into petroleum. This seminal paper, containing the concept of a "geological fence," was published by the American Association of Petroleum Geologists in 1946.

Gulf Research & Development Company had pioneered the application of geophysical techniques in petroleum exploration and also had laid a solid foundation for the new discipline of reservoir engineering. Perhaps because all of its geophysicists and reservoir engineers had been trained as physicists, mathematicians, and electrical engineers, Gulf had a cavalier attitude toward geological research, which it seemed to feel was inherently descriptive and fundamentally nonrigorous. To his great credit, Ben later dissipated this attitude.

Ben's field experience had led him to the strongly held view that only a multidisciplinary team of scientists could appreciate, much less hope to overcome, problems that interested him, since these problems extended from organic and inorganic geochemistry (and indeed critical elements of geophysics) to stratigraphy, mineralogy, the composition and correlation of crude oils, the clastic deposition of recent sediments, and the mechanics of oil-field structural development, the last having as a particular object a better understanding of the entrapment of petroleum by folding and faulting.

In pursuit of his ambitious research aims, Ben was able to hire in the immediate postwar years a group of some twenty scientists whose publications eventually ranged over such topics as the diagenesis of oil-field waters, the properties of clay minerals as they related to organic matter in sediments and problems in drilling, the fundamentals behind the interpretation of wire-line logs, the

deformation of sediments associated with salt diapirs, field investigations of the occurrence of recent barrier bars and beaches, and, partly through his association with Will Hanson and the Gulf Fellowship at Mellon Institute in Pittsburgh, problems of organic geochemistry and crude-oil correlation.

That Ben was able to put together a fecund research team in a short time was a tribute both to his innate charm—to those who worked for him he could only be described as a lovable man—and to the pertinacity with which he sieved candidates' qualifications until he finally reduced his choice to one individual, whom he almost invariably succeeded in hiring.

Among those who worked with Ben are Jack Currie, Walter Kelley, Jack Ludwick, Duncan McConnell, Ivan Milne, H. W. Patnode, A. C. Trowbridge, and Bill Walton. For Ben, the decade 1945–1955 was outstandingly fruitful. Toward the end of this period, in 1954–1955, Gulf experienced one of those arbitrary internal convulsions that characterize many large U.S. corporations and that, in retrospect, have an exiguous effect on their competitiveness. Within Gulf, the trendy slogan became “decentralization”; accordingly, every activity that could be decentralized, irrespective of merit, was. Gulf's geophysical field work, for example, previously centralized at Gulf Research & Development Company (and later to be largely recentralized there), was dissipated among small groups in widely dispersed field offices. What was particularly unfortunate and unforeseen was the feeling engendered in many of the operating arms of Gulf that they were now completely independent entities and that any truck with the head office, or what might be regarded as the minions of the head office, should be eschewed. Ben felt that if corporate money spent on research was not to be wasted, operating people should be kept continuously aware of progress made at Gulf Research & Development Company and, if patently recalcitrant about using new information, should have pressure to do so applied; mindless decentralization to him was nonsensical. He faced, however, a period withing Gulf of extreme pendulum-swinging, when normally rational businessmen accepted such egregious slogans as, “Reports are double time-wasters; wasteful to write, wasteful to read.” Ben pushed with his usual voluble enthusiasm for a common-sense approach to relations between his Geology Division and field geologists, but he was ahead of his time. In 1956, to placate operating geologists overly worried about their turf, Ben was reassigned within Gulf Research & Development Company, becoming Head of Information Services. It was typical of the man that he tackled his new and unwelcome role with enthusiasm and originality. He retired in 1963.

Ben was married twice. His first marriage was dissolved in 1943. There were four children of the union: John R., who predeceased his father; William C. of Katonah, New York; Ben B., Jr. of White Plains, New York; and Nancy I. Rouse of Monmouth, New Jersey. In late 1943, he married Elizabeth Laura Jordan, and this marriage endured happily until his death.

In retirement, Ben never lost his interest in geology and oil finding and regularly attended pertinent meetings and seminars in western Pennsylvania. During 1968, he spent some time in Israel, during which he adapted his knowledge of Quaternary geology to the excavation in Tell Ashdod.

At home, Ben's cabinet-making and carpentry can only be described as professional in quality. His natural bent for drawing, after enthusiastic tuition from Mary Shaw Marohnic of the Pittsburgh Arts and Crafts Center, led him to paint in oils and sketch in pen and ink at about the 95th percentile level of amateur artists. Ben was particularly adept at depicting dogs; his favorite subjects were his beloved German shepherds, which he and his wife bred and trained, with outstanding competitive success.

Memories linger: of half-closed eyes, a head cocked sideways, an impish smile; of an irate “five years ago we were ten years ahead; now we're behind”; and, to me an abiding sadness that Ben never wrote the treatise his talents so richly promised, a work that would inevitably have become known simply as “Cox on Rocks.”

Ben was a member of numerous professional organizations. Among these were the American Institute of Mining, Metallurgical and Petroleum Engineers, American Association of Petroleum

Geologists, American Society of Economic Paleontologists and Mineralogists, American Association for the Advancement of Science (Fellow), Iowa Academy of Sciences (Fellow), Kentucky Academy of Sciences (Fellow), and the Geological Society of America (Fellow).

### **SELECTED BIBLIOGRAPHY OF B. B. COX**

- 1946 Transformation of organic material into petroleum under geological conditions ("the geological fence"): American Association of Petroleum Geologists Bulletin, v. 30, p. 645-659 (Reprinted, 1949, Appalachian Geological Society Bulletin, v. 1, p. 11-23).