In Memoriam William A. Cobban 1916-2015

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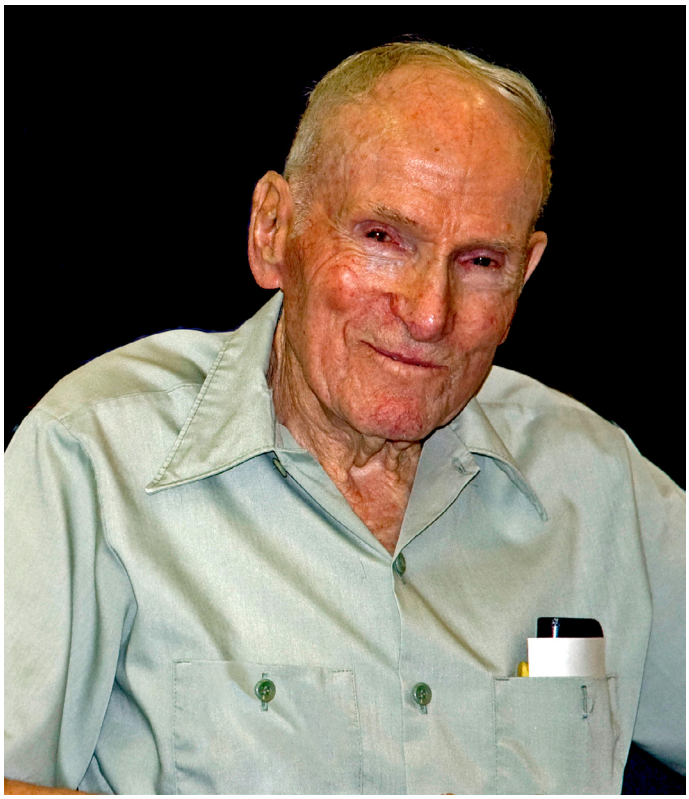

Bill Cobban, my friend and mentor of almost 40 years, died peacefully in his sleep on April 21, 2015. He was 98 years old and had been in declining health for several years. He was probably the best known and most respected invertebrate paleontologist in the United States. He was the last of a distinguished lineage of USGS paleontologists stretching back to the 1870s that included F. B. Meek, T. W. Stanton, and J. B. Reeside, Jr. Since at least the 1960s, every student of the Upper Cretaceous of the Western Interior knew Bill; many benefitted from a visit to the USGS Mesozoic Invertebrate Collections in Denver, Colorado; some ended up writing papers with him; and all were amazed by his detailed knowledge of Late Cretaceous faunas, biostratigraphy, strata, radiometric dating, and shoreline movements. When he started work at the USGS in 1949, there were 10 molluscan zones representing the entire Upper Cretaceous; by 2006, there were 66 zones, due primarily to Bill's detailed work and meticulous record keeping. His professional achievements were summarized in Larson and Landman (2007), which includes a chronological publication record beginning in 1942 that contains more than 300 papers, many of seminal importance.

Less well known—although hidden in plain sight in that exhaustive publication list—was Bill's interest in and fondness for the Upper Cretaceous of New Mexico, especially the Cenomanian, Turonian, and lower Coniacian parts of the section. He was especially interested in southern half of the state, where outcrops are isolated and widely scattered, but record the earliest cycles of transgression and regression of the Late Cretaceous Seaway in the Western Interior. The alteration of marine and nonmarine rocks combined with little previous study of the marine faunas created an irresistible attraction that drew Bill's attention to New Mexico. Southern New Mexico is also the area in which the cold water, Boreal faunas of the Western Interior intermingled with warm water, Tethyan faunas, thus providing a means of international correlation. It was this interest that forged our partnership.

As a new employee of the New Mexico Bureau of Mines and a freshly minted Ph.D. (on Ordovician nautiloids) in 1976, I was asked to work on the stratigraphy and paleontology of the Upper Cretaceous of New Mexico. The best exposed and closest outcrops of the Upper Cretaceous to the Bureau are in the Carthage Coal Field, 20 miles southeast of Socorro. I was a quick learner in those days and soon realized that I needed some professional help. My first letter to Bill explaining my Carthage Project, which was closely tied to coal studies in the state, was quickly answered by Bill with an offer to help in any way that he could. He included a copy of USGS Professional Paper 645 (Cobban and Scott, 1972), a detailed study of the ammonites of the Graneros Shale and Greenhorn Limestone near Pueblo, CO. Although I did not realize it then, PP 645 was Bill's way of showing me how to do paleontology and stratigraphy properly; i.e., by measuring sections in painstaking detail and tying every fossil collection to a single stratigraphic bed or unit. In all the years I worked with Bill, he never once told me how paleontological/biostratigraphical research should be done; he simply showed me by example how he did it.

My new found knowledge was soon used to measure and collect the section at Carthage, which both Bill and I initially thought contained only the first two cycles of transgression/regression of the western shoreline. These first two cycles are represented by the Dakota Sandstone at the base, the Tokay Tongue of the Mancos Shale, the Tres Hermanos Formation (with a nonmarine core), the D-Cross Tongue of the Mancos, the Gallup Sandstone, and the Crevasse Canyon (with the Dilco Coal Member) at the top. In 2003 I discovered, purely by accident, that there is another tongue of Mancos Shale (the Mulatto) above the Dilco at Carthage, meaning that there are three depositional cycles preserved there—a fact published in a 1910 coal study that I had been unable to verify by dedicated field work! This oversight was corrected in Hook (2010), a paper on which Bill declined coauthorship, because he felt the discovery was mine alone, although he contribited substantially to it.

This 1,200 foot-thick measured section at Carthage was the first I had measured. However, it was substantially less detailed than necessary to satisfy my mentor's standards: it had 52 units that contained five fossil zones. Obviously, I had a lot to learn. By contrast the 575 foot-thick Tokay Tongue of the Mancos Shale at Carthage described in this volume (Hook and Cobban, 2015) has 234 units and 35 fossil collections tied to individual units. As our knowledge of the Upper Cretaceous increased, more and more detailed collecting was required. Bill always stressed that every paper we published was simply a progress report.

I soon realized that one control point (Carthage) was not enough to understand the Upper Cretaceous of southern New Mexico. With Bill's remote guidance from Denver, I ventured south 70 miles to the isolated Upper Cretaceous exposed in Mescal Canyon, on the east side of the town of Truth or Consequences. The lower part of the section in Mescal Canyon is similar to that at Carthage,

and also contains good exposures of the "Greenhorn Limestone." From Mescal Canyon, it was southwest 50 miles to the Cookes Range, where N. H. Darton, the great USGS field geologist and one of Bill's geologic heroes, had discovered an unusual, but poorly preserved Late Cretaceous ammonite fauna. The only rock units I recognized in the Upper Cretaceous at Darton's locality southwest of Cookes Peak were the distinctive orange-weathering, thin, nodular limestones at the base of the "Greenhorn." Of course, the abundance of the oyster *Pycnodonte newberryi* cemented the correlation with Carthage and Mescal Canyon. A little higher, I found Darton's ammonite bed, which consisted of hundreds of internal molds of ammonites weathered matrix free on the outcrop. These molds included the finely ribbed, small ammonite *Neocardioceras juddii* and outer whorls of the larger, coarsely ribbed ammonite *Pseudaspidoceras pseudonodosoides*, neither of which had been identified in New Mexico before. In my naïveté, I thought that the former represented the inner whorls of the latter.

Bill was so excited when he received this collection, that he was on a plane to New Mexico on October 19, 1976, less than two weeks later. I took him to Darton's locality, where Bill patiently explained the facts of ammonite morphology to me and we collected one of the most prolific ammonite beds in New Mexico, along with several other equally exciting faunas. Thus began my life-long association with Bill. For the next five years we were in the field together three or four times a year for a least a week at a time. I usually spent a week with Bill in Denver in the winter discussing the collections and deciding what papers should be written and, more importantly, where I should concentrate my field work. I was his boots on the ground in New Mexico at Riley, Puertecito, D-Cross Mountain, Big and Little Burro Mountains, Cane Spring Canyon, Bull Gap, Springer, and on and on. I enjoyed every minute of it.

The work in the Cookes Range and surrounding areas in southwestern New Mexico led to the discovery of the most diverse late Cenomanian ammonite fauna in the world (64 species in 31 genera) and the establishment of three new ammonite range zones in the upper Cenomanian of the Western Interior (Cobban et al. 1989). So, the Cooke's Range looms large in my memories of Bill.

I saw Bill for the last time in on March 4, 2015 when I visited him and the collections in Denver. Bill was not strong enough to go to the USGS collections with me, but we had lunch together the two days I was in town. We talked of the many good times we had in the field, especially the "Cookie" Range with its famous banana tree locality. The mountain's name is in reference to the field cookies we had on that first trip and every subsequent field trip in New Mexico: Pepperidge Farm® Bordeaux® Cookies, ever after called "Bill Cobban Field Cookies." Of course, there is no banana tree there in the desert of southwestern New Mexico; a colleague of ours had thrown the banana peel from his peanut butter and banana sandwich into a tree at Shale Spring, on the east side of the Cookes Range. Ever since, we referred to it as the banana tree locality.

The first paper I co-authored with Bill was on the oyster *Pycnodonte newberryi* (Hook and Cobban, 1977). It was also the first in a series of eight papers we published on important Upper Cretaceous guide fossils in New Mexico. We continued that series until I left Socorro in 1981 to work for an oil company in Houston. I was gone for 20 years before moving back to Socorro in 2002. However, Bill and I continued to publish papers in the interim on the research we did during those magical six years of unraveling the Upper Cretaceous of New Mexico. To date we have coauthored more than 30 papers on the Late Cretaceous stratigraphy, paleontology, biostratigraphy, and paleogeography of New Mexico.

Since my return to New Mexico, Bill and I have written four more papers on Late Cretaceous oysters because their evolution is extremely interesting and they are such useful fossils for geologic mapping. Oysters are generally abundant (especially in near shore sandstones), are well preserved (because they have calcitic shells that preserve as original shell material), have limited vertical ranges, and are easily identified.

The last paper Bill worked on actively with me before his health deteriorated concerns the echinoid *Mecaster batnensis*. Echinoids are extremely rare in the Western Interior Upper Cretaceous, although they are abundant at the base of the "Greenhorn" in the Cookes Range, Mescal Canyon, Carthage, and elsewhere in west-central New Mexico. That paper has been submitted for publication. I have notes on several other New Mexico papers that Bill had hoped we could work up for publication: some on oysters, some on ammonites, one on a coral (as rare as echinoids in the Western Interior), another on an echinoid from higher in the section, and a monograph on the Upper Cretaceous molluscan faunas of New Mexico, what Bill called a picture book of key Upper Cretaceous fossils. I am going to miss having my friend and coauthor to talk with as I prepare these papers. As I look back on my long association with Bill, I feel honored to have worked with him and to have been his friend. I look forward to continuing his legacy of detailed, careful work on the Upper Cretaceous of New Mexico.

Acknowledgment

The photograph of Bill Cobban was taken by Neal Larson, Larson Paleontology Unlimited, Keystone, South Dakota, on August 27, 2006 at a sympsium in Golden, Colorado, on the Upper Cretaceous of the Western Interior that honored the lifetime achievements of Bill. According to Neal, this photograph was taken while I was presenting a paper by Bill and me on a condensed middle Cenomanian succession in the Dakota Sandstone exposed on the Sevilleta National Wildlife Refuge, New Mexico.

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