General Remarks on the Pre-Selma Cretaceous Strata of Western Alabama

By LOUIS C. CONANT

STUDIES OF PRE-SELMA CRETACEOUS CORE SAMPLES FROM THE OUTCROP AREA IN WESTERN ALABAMA

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ABSTRACT

The Vick formation, previously known in only one small outcrop area, has now been identified in the shallow subsurface. Evidence in this series of papers points to a nonmarine environment for the Vick and mainly a shallow and commonly brackish-water marine environment for the overlying Tuscaloosa group and the McShan and Eutaw formations. The distribution of gravel in several formations suggests that the Tennessee and Sequatchie Rivers flowed into the Cahaba and Warrior Rivers during Cretaceous time.

EXTENT AND THICKNESS OF THE VICK FORMATION

The preceding papers have supplied many facts regarding the thickness, petrology, paleontology, and conditions of accumulation of the pre-Selma Cretaceous strata of western Alabama; they have confirmed some theories that evolved during the surface mapping from 1944 to 1948; and they have supplied new information. Here an attempt is made to synthesize some of the newly acquired subsurface information with knowledge previously obtained, some of it not heretofore published.

The Vick formation has been entirely unknown beyond its 1-square-mile outcrop area (fig. 1; Conant, 1946), and its suggested Early Cretaceous age has never been satisfactorily established. The presence in the Webb hole of at least 104 feet of beds that seem to be of the same unit indicates that the Vick is present at least 15 miles downdip, or southwest, from the outcrop area. This supports the original concept that the few outcrops of the Vick formation represent a subsurface unit that is almost completely overlapped by the beds of the Tuscaloosa group. The exact age of the Vick, however, is still not established, though Monroe reports fossil leaves of probable Cretaceous age, and also points out the similarity between some of the core samples and the Lower Cretaceous beds of the deeper subsurface. It is only fair to note, however, that some geologists who have studied

the subsurface units in Mississippi and Alabama believe the Vick should be correlated with the "Lower Tuscaloosa" of the subsurface, which is of Late Cretaceous age. A satisfactory resolution of the Vick problem will probably require additional samples from the updip area, where few drill holes have encountered it. Until this is accomplished, the Vick formation is considered to be of Early(?) Cretaceous age.

If the 104 feet of sediments in the Webb hole is the total thickness of the Vick, then the formation has about the same thickness as at the outcrop, where it was estimated to be about 100 feet thick (Conant 1946). This is in marked contrast to thicknesses of 2,500 to 3,000 feet of beds of Jurassic and Early Cretaceous age that are commonly encountered in oil-test wells in Wilcox County, Ala., about 50 miles farther south. If the beds identified as Vick on the outcrop and in the Webb hole are correlative with some of the Lower Cretaceous beds of the deeper subsurface, it is surprising that they are not thicker in the Webb hole, perhaps as much as 500 feet thicker. Monroe believed that the hole bottomed in shale of Paleozoic age, but he also considered the possibility that the lowest rocks encountered in the hole may belong to the Vick formation. It might well be, however, that these lowest rocks are the top of another succession of Jurassic or Lower Cretaceous strata that are a few hundred feet thick.

Geologists who have studied the deeper subsurface sediments in the Coastal Plain of central-western Alabama and central-eastern Mississippi (Applin and Applin, 1947; Eargle, 1948) have shown that the top of Lower Cretaceous rocks is marked by the highest occurrence of red shale containing "pink-lime" nodules and veinlets, and that it represents a major uncomformity. Evidence of this uncomformity should be carefully searched for in cores from updip holes and in water wells as they are being drilled. Carefully prepared structural maps, showing the configuration of both the bottom and top of Lower Cretaceous sediments, and isopach maps of this unit should indicate the areal limits of rocks of Early Cretaceous age in the absence of fossil evidence. Also, the lower part of the Cretaceous rocks in eastern Alabama and western Georgia should be studied and correlated with the Cretaceous rocks in western Alabama to determine age and facies relations.

RELATIONS BETWEEN CRETACEOUS AND PRESENT DRAINAGE SYSTEMS

The 30 feet of coarse gravel at the presumed base of the Vick formation in the Webb hole is especially interesting. During the surface mapping, Monroe, Conant, and Eargle (1946) frequently noted that the sediments in nearly every formational unit were somewhat coarser

near the present Warrior River. This prompted them to wonder if the Warrior follows the approximate course of a Cretaceous stream. The presence of so much gravel in the Vick formation in the Webb hole, near the Cahaba River, brings to mind a water well this writer saw drilled at Brent, Ala. (fig. 12), on Jan. 1, 1946. That well, drilled for a municipal water supply in the heart of the town, started on the flood plain of the Cahaba River about 25 feet above an exposed contact across the river between Paleozoic rocks and the overlying Coastal Plain sediments. For 64 feet the drill penetrated clay, sand, and gravel. At that time it was not certain whether the sediments are of Cretaceous age, occupying an ancient stream channel, or are much younger, perhaps filling a Pleistocene valley of the Cahaba River. During Cretaceous time a major stream may have had a course similar to that of the present Cahaba in the Brent area, and was entrenched at least 40 feet in the Paleozoic rocks. If this interpretation is valid, the material encountered in the water well is the basal part of the Coker formation. About 12 miles downstream, in the area of the Webb well, the supposed ancient river deposited similar coarse gravel during Vick time, so at least part of gravel at Brent may belong to the Vick formation instead of the Coker formation.

Any assumption that the Warrior and Cahaba Rivers are descendants of Cretaceous streams has several interesting implications. For one thing, it means that at least part of the major stream pattern has not been greatly changed by tilting, Coastal Plain deposition, or other cause. An understanding of these Cretaceous drainage relations may well explain some aspects of the abnormal course of the Tennessee River. As shown on figure 14, the Cahaba River is directly in line, geographically and structurally, with the Tennessee River above Chattanooga, Tenn. At Chattanooga the Tennessee River turns sharply westward out of a mature valley and follows a deep gorge through a high ridge. In another few miles it joins the Sequatchie River and turns southwestward again, then for 60 miles follows a mature valley on the breached Sequatchie anticline directly toward the headwaters of the Warrior River. At Guntersville, Ala., the Tennessee River again, for no apparent reason, turns abruptly westward, leaving its well-developed valley. Only a low divide separates the headwaters of the present Warrior from the reach of the Tennessee near Guntersville. These relations, which have been observed and discussed by many others (for example, Hayes and Campbell, 1894; Johnson, 1905; Adams, 1928), suggest strongly that at one time the Tennessee River continued southwestward from Chattanooga to the course of the present Cahaba River, and that the Sequatchie River at one time flowed into the Warrior River. This drainage pattern

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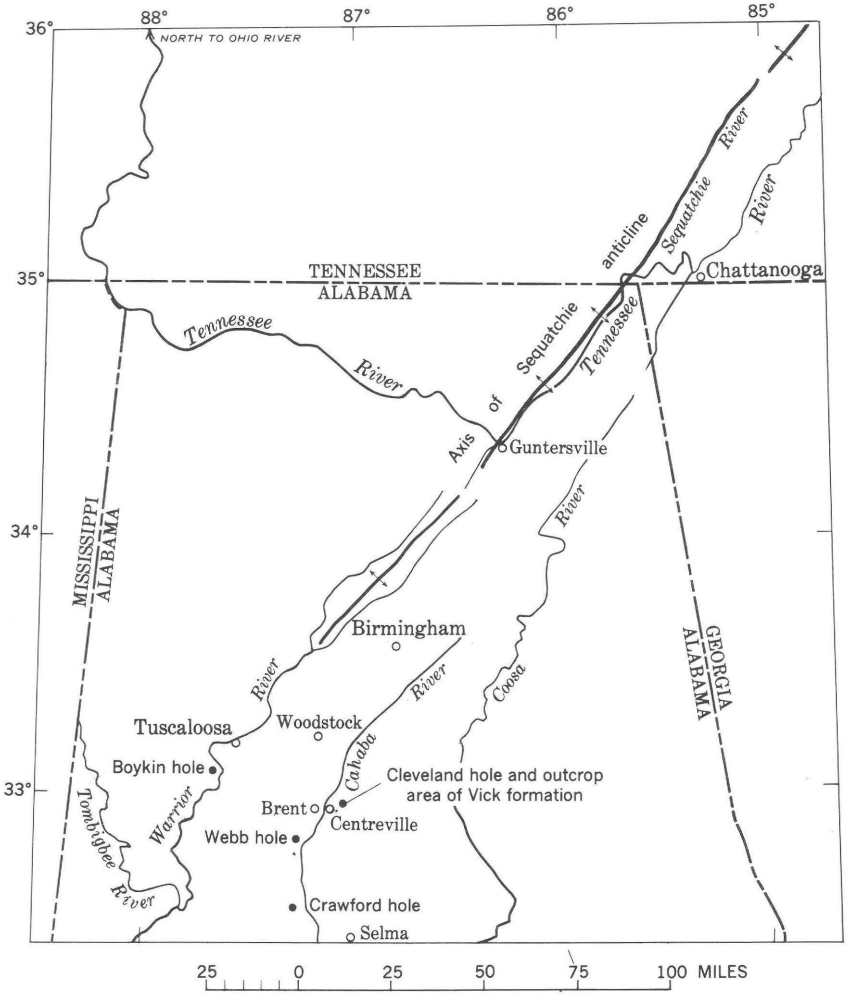

FIGURE 12.—Major drainage lines in north Alabama and part of Tennessee.

during Cretaceous time would explain the greater abundance of gravel in the Cretaceous sediments near the present rivers.

The gravel in the Gordo formation is much coarser in the Webb well than in the Boykin. If the samples from these two wells are typical of their areas—the Warrior and Cahaba Valleys, respectively—then it appears that coarser gravel was being transported and deposited in the Cahaba River Valley than in the Warrior Valley. Likewise, the abundant gravel in the lower 30 feet of the McShan formation in the Crawford hole may have similar significance. In the surface mapping of the beds in the area of the Warrior Valley a little gravel was observed at the base of the McShan, but at many places the gravel may have

been overlooked. If the Crawford samples give a true representation of the basal McShan in that area, then it appears that a larger or more active stream was entering the Gulf at that time along the course of the Cahaba River than along the course of the Warrior.

Thus, the suggestions are strong that from some time during the Early Cretaceous until McShan time in the Late Cretaceous an ancestral Cahaba River was transporting more gravel than was the supposed ancestral Warrior River. This, in turn, suggests, but by no means demonstrates, that the Tennessee River may have flowed into the Cahaba, and that the Sequatchie River may have flowed into the Warrior.

Unpublished observations, by this writer, of the Coastal Plain beds where they lap onto the folded Appalachians, particularly near Woodstock, Ala. (fig. 12), indicate that a subdued valley-and-ridge topography existed at the beginning of deposition of Upper Cretaceous sediments. The relief on this surface was on the order of 100 to 200 feet. Rather than indicating a well-developed peneplain with sluggish streams inundated by the sea, this observation suggests that the Cretaceous sea advanced onto an area of moderate relief and moderately active drainage. The coastline probably was strongly indented, and many embayments had brackish water. If this deduction is correct, further detailed work on the Cretaceous sediments in western Alabama should reveal evidence of considerably different environments of deposition within short distances.

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