

THE PRE-CHATTANOOGA DEVELOPMENT OF THE NASHVILLE DOME¹

CHARLES W. WILSON, JR.

DEPARTMENT OF GEOLOGY, VANDERBILT UNIVERSITY

ABSTRACT

A sub-Chattanooga geologic map showing the areal distribution of pre-Chattanooga formations, a structure contour map on the Chattanooga shale, and a cross section across central Tennessee have been prepared to illustrate the stratigraphy and structure of the Nashville dome. The dome is shown to have been developed synchronously with mountain building activity in Appalachia. When Appalachia was being subjected to tectonic stresses and hence had high, moderately high, or moderately low relief and elevation it supplied clastic sediments for deposition in the Appalachian geosyncline. At the same time the Nashville dome was relatively high and was either completely above sea level, above for most of the time, or was submerged only on the outer flanks. When Appalachia was not being subjected to tectonic stresses it had low relief and elevation and limestones were deposited in the geosyncline. At the same time the Nashville dome was relatively low and was probably below sea level for most, or all, of that time. The sympathetic relationship between the histories of Appalachia and the Nashville dome, as demonstrated by such *sensitive synchronism*, is believed to demonstrate that the structural features in central Tennessee are the direct result of the tectonic stresses that were active in Appalachia.

It is thought that the dome was uplifted essentially by vertical bulging caused by stresses transmitted plastically in the deeper rocks of the crust. Uplift occurred many times, the axis of greatest uplift shifting east or west in accord with the intensity of stresses transmitted westward from Appalachia. Small, local folds, superimposed upon the flanks of the dome, once established as either an anticline or syncline remained so throughout all future warpings and were rejuvenated with each period of warping.

The fingers of Richmond and Silurian formations that occur on the west and south flanks of the dome are postulated to be erosional remnants preserved by favorable structural position in synclinal areas, rather than deposits in "long, narrow, embayments" as had previously been postulated by other workers.

The history of the dome is believed to have started as early as the Cambrian. The record of deposition on the dome may be summarized in Table 1.

¹Read by title, meeting of Tennessee Academy of Science at Nashville, Dec. 1, 1934. This paper is being published in full in the *Journal of Geology*, Vol. 43, 1935.

TABLE 1
Deposition in the Pre-Chattanooga development of the Nashville Dome

Geologic Time	Record of deposition on the Nashville dome	Inferred elevation of the Nashville dome in reference to sea level	
Chattanooga Shale			
Devonian	Erian to Chemung	Above	
	Ulsterian	Limestone (12') and some sandstone (found only on northwest flanks)*	Above (Except for deposition of "Pegram")
	Oriskany		Above
	Helderberg		Above
Silurian	Cayugan		Above
	Lockport	Limestone, argillaceous limestone, and some sandstone (150')*	Below (Except for highest point of dome)
	Clinton	Argillaceous limestone (10')	Above (Except for deposition of Osgood)
	Albion	Limestone, and some sandstone (20')*	Above (Except for deposition of Brassfield)
	Richmond	Limestone, shale, and some sandstone (50')*	Above (Except for deposition of Fernvale and Arnheim)
	Maysville Eden	Limestone and argillaceous limestone (50')	Above (Except for deposition of Leipers)
Ordovician	Trenton	Limestone and some argillaceous limestone (300') limestone (100')	Below
	Black River		Below
	Blount		Above
	Stones River	Limestone (275' plus)	Below

*These sandstones are only local deposits along the shore.