UPPER CRETACEOUS CHALK AT WETUMPKA IMPACT STRUCTURE, ALABAMA: POST-IMPACT SEDIMENT? D. T. King, Jr.[1] and L. W. Petruny[1], [1]Geology Office, Auburn University, Auburn, AL 36849 (kingdat@auburn.edu; lpetruny@att.net)

Introduction: Wetumpka impact structure, a 7.6 km diameter, marine impact feature, in central Alabama (Figure 1), contains a megabreccia resurge unit that fills most of the crater interior (within the structure's crystalline rim terrain; Figure 1). In addition, there is an structurally disturbed, exterior terrain, located on the southern and south-western quadrant of the structure and outside the structure's crystalline rim. Both the megabreccia resurge unit and the extra-structure terrain contain significant aerial tracts of Upper Cretaceous chalk. This Upper Cretaceous chalk, specifically the Mooreville Chalk, is a distinctive inner Coastal Plain formation that crops out, except for the Wetumpka area, in an east-west outcrop belt across central Alabama. This outcrop belt occurs approximately 25 to 30 km south of the Wetumpka impact structure. Therefore, the Mooreville Chalk within the Wetumpka impact structure is an anomalous occurrence that is not a part of the outcrop belt. Post-Cretaceous erosional effects account for the distance between the east-west outcrop belt and the significant Mooreville Chalk tracts within the Wetumpka impact structure.

The target stratigraphy at Wetumpka consisted of 30 to 100 m of sea water, an estimated 30 m of Mooreville Chalk, pre-Mooreville Upper Cretaceous sand units (~90 m), and basement crystalline rock (pre-Mesozoic schists and gneisses; [1]).

Mooreville Chalk at Wetumkpa: The second state geologist of Alabama, Eugene Allen Smith, was the first to take note of isolated tracts of Mooreville Chalk near Wetumpka. In 1894, he remarked that 'a depression of significant depth' must be envisioned to account for the preservation of Mooreville Chalk so far from the east-west outcrop belt [2]. Smith [2] collected fossils from the Mooreville Chalk near Wetumpka, which are not found today owing to the region's commercial and residential development, allowing him to correlate the Mooreville Chalk within and near the Wetumpka impact structure with the lowermost 30 m of the formation within the east-west outcrop belt in western Alabama. This observation led King [3] to suggest that this finding might provide a more specific stratigraphic age for the Wetumpka impact structure (i.e., late Santonian to early Campanian; [4]). The reasoning was that the lower part of the Mooreville Chalk within and near the Wetumpka impact structure was the uppermost target unit. This interpretation was supported by the observation that no younger stratigraphic units had been found within or near the structure. Subsequent core drilling to a depth of 200 m at the center of Wetumpka impact structure [1] and a detailed examination of that core [5] confirmed that no younger target materials lie buried in the upper 200 m at Wetumpka. Johnson [5] found that no Mooreville Chalk could be indentified in the drill cores 1-98 and 2-98, but that other Upper Cretaceous target units (pre-Mooreville sands and clays) were abundant in some parts of the drill cores.

The Mooreville Chalk at Wetumpka was mapped in detail by Neathery et al. ([6]; Figure 2) and remapped by Nelson [7]). According to Figure 2, the Mooreville Chalk at Wetumpka is confined strictly to irregularly shaped aerial tracts within the structure's interior terrain (i.e., within the area encircled by the horseshoe-shaped crystalline rim) and elongate-shaped tracts in the southern part of the interior terrain and the whole of the exterior terrain (i.e., the area of structurally disturbed Upper Cretaceous strata located directly to the south and southwest of the structure, outside the crystalline rim of the structure). Both within the interior and exterior terrains, Mooreville Chalk is in contact with older Upper Cretaceous target units (i.e., the subjacent Eutaw Formation (littoral sands and shales) and the older Tuscaloosa Group (fluvial channel and overbank sequences). King et al. [8] interpreted the relationship of the Mooreville Chalk tracts within the interior as displaced megablocks akin to megablocks of the Eutaw and Tuscaloosa. King et al. [9] interpreted the elongate-shaped Mooreville Chalk tracts of the extra-structure terraine as fault-bounded blocks that are part of a sort of limited 'decollment zone' that is akin to the concentric decollment zone at Chesapeake Bay impact structure, a larger but in many ways a comparable marine impact structure in Virginia.

Post-impact Mooreville?: Outcrop conditions do not provide a definitive way of determining if the Mooreville Chalk in any given outcrop is pre- or post-impact. We have not found impact spherules or other ejecta within Mooreville Chalk at Wetumpka, and additional core drilling is required to obtain samples useful for this purpose. New drilling at Wetumpka, which will penetrate the Mooreville Chalk in the interior terrain is planned for 2009. Edwards and Powars [20] reported impact-damaged dinocysts from post-impact sediments of the late Eocene Chesapeake Bay impact structure, Virginia. At a GSA Field Forum held at Wetumpka, Edwards [11] reported possible impact dam-

age to dinocysts recovered from site IT-1 (Figure 2), but no damage from dinocysts at site ET-1. This suggests the prospect of post-impact Mooreville at site IT-1 and perhaps other sites in the interior.

References: [1] King D.T., Jr. et al. (2002) *EPSL, 202.* [2] Smith E.A. et al. (1894) *Geol. Surv. Ala. Spec. Rept. 6.* [3] King D.T., Jr. (1997) *Ala. Geol. Soc. Guidebk 34c.* [4] Liu K. (2007) *Cretaceous Res., 28.* [5] Johnson R.C. (2007) *M.S. thesis, Auburn U.* [6] Neathery T.L. et al. (1976) *GSA Bull., 87.* [7] Nelson A.I. (2000) *M.S. thesis, Auburn U.* [8] King D.T., Jr. et al. (2003) *Cratering in Marine Environments*, Springer. [9] King D.T., Jr. et al. (2006) *MAPS, 41.* [10] Edwards L.E. & Powars D.S. (2003) *Palaios, 18.* [11] Edwards L.E. (2007) Unpubl. presentation at GSA Field Form.

Figure 1 (right) and **Figure 2** (below; from [6, 8].