

ART. XXIX.—*On the Geological Position of the Eocene Deposits of Maryland and Virginia*; by GILBERT D. HARRIS.

IN the spring of 1830,* T. A. Conrad made a visit to the western shore of Maryland for the purpose of collecting fossil remains and observing the geological features of the region. He discovered in the vicinity of Ft. Washington beds that he correlated with the London Clay of England since they contained among other extinct species *Venericardia planicosta* of Lamarck. A few years later† he called attention to the resemblance of *Cucullæa gigantea* of this locality to a European species, and noted the similarity of *Ostrea compressirostra* and the European *Ostrea bellovacina*. In the same work he described many new species from Claiborne, Alabama, mentioned others from Vance's Ferry, South Carolina, and classified Maryland, Alabama, and South Carolina deposits alike as "Middle Tertiary or London Clay and Calcaire Grossier."

The Rogers in 1839‡ differentiated this series from the overlying Miocene and underlying Cretaceous in Virginia and correctly referred it to an Eocene horizon and described several of its characteristic species.

Conrad, in the Proceedings of the National Institution, 1841,§ mentioned many Eocene localities in the Gulf and Atlantic slope States and pointed out the resemblance of the Upper Marlboro rocks of Maryland to those of Bangor, England, *Ostrea bellovacina* he affirmed was found at either locality.

Up to this time, no stress had been laid on the stratigraphic position of the various Eocene outcrops in America; to know that they were Eocene was all sufficing. In 1855, however, Conrad|| established three subdivisions in the Alabama and Mississippi deposits of this series, naming them in descending order, the Vicksburg, Jackson and Claiborne groups. In 1865 he instituted another, the Lignite Formation,¶ wherein he seemingly desired to include beds lying between the "Buhrstone," as described by Tuomey, and the Cretaceous. To this formation he referred the dark colored friable clays of Piscataway Creek and the basal bed of Tuomey's section on Bashia Creek, Clark Co., Alabama; but the "Marlboro rock" to use

* Jour. Ac. Nat. Sci. Phila., 1st Series, vol. vi, 1830, pp. 205 et seq.

† Fossil Shells Tert. Form. N. A., Harris' Reprint, p. [21].

‡ Trans. Am. Phil. Soc., N. Ser., vol. v, 1839, p. 347 et seq.

§ Second Bull., pp. 172-179.

|| Proc. Acad. Nat. Sci. Philad., vol. vii, p. 257.

¶ Proc. Acad. Nat. Sci. Philad., vol. xvii, 1865.

his own expression, belongs to a higher or "Buhrstone" horizon.

Practically the same conclusions were reiterated by Heilprin* in a "Note on the Approximate Position of the Eocene Deposits of Maryland," published in the Proceedings of the Academy of Natural Sciences of Philadelphia, 1881. Conrad's stratigraphic nomenclature he modernized to some extent and used the term "Eo-lignitic" in place of Conrad's "Lignite Formation."

It was not until 1886 that the typical section of American marine Eocene, namely, that of Alabama was published. This was given in Bulletin No. 43 of the U. S. Geological Survey by Smith and Johnson. In the same year also, appeared Bulletin No. 1 of the State survey of Alabama in which Aldrich listed the known species from the various stages and sub-stages of the series. Herein is found the clue to the special problem in question, i. e., what horizon in the Alabama section does the Eocene of Maryland and Virginia (Pamunkey formation of Darton) represent. Whereas the Buhrstone and the section on Bashia Creek furnish few or no characteristic Maryland and Virginia Eocene species as neither Conrad nor Heilprin were able to show although for some cause they believed all should be relegated to practically the same horizon, the Bell's Landing sub-stage including the Bell's Landing, Gregg's Landing, and Nanafalia deposits do furnish such characteristic fossils. During a recent visit to these localities I observed that the material in which the fossils are imbedded is very similar to that of the Virginia Eocene, while the fossiliferous zones are widely separated by beds of fine dark lignitic clay. The species obtained that are most telling as indices of horizon are as follows:

Dosiniopsis lenticularis Rogers; found at Bell's Landing; also very abundant in the Maryland and Virginia (Pamunkey) Eocene. A slight varietal form from the vicinity of Piscataway Creek and Ft. Washington has been named *D. meeki* by Conrad.

Cucullæa transversa Rogers; common in the Gregg's Landing bed and in Virginia, probably simply a small variety of *C. onochela* Rogers and *C. gigantea* Conrad.

Venericardia planicosta, var. *regia* Con.; common in all members of the Bell's Landing sub-stage as well as in Virginia and Maryland.

Ostrea compressirostra Say; abundant in the Bell's Landing horizon of Alabama and in Maryland and Virginia.

Turritella mortoni, var., *postmortoni*, nov var.; very abundant at Gregg's and Bell's Landing; rare among other *T. mor-*

* Pp. 444-447.

toni from Aquia Creek, Virginia; characterized by its rather smaller size, plainer surface, extremely sharp basal carina. See figs. 1, 2, and 3.

Turritella humerosa Conrad; abundant in several varietal forms in the Bell's Landing sub-stage; common in Maryland and Virginia. This species ranges from the Midway to the Claiborne inclusive, but seems exceptionally well developed at this horizon.

Turritella prævineta Conrad; very common in the Bell's Landing sub-stage of Ala.; rare at Aquia Creek, Va. The Virginia specimens are less strongly carinated than their Alabama representatives.

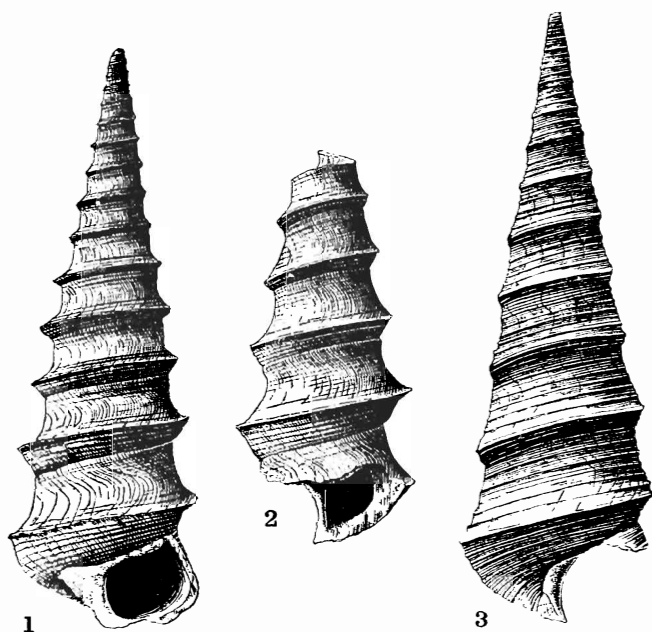
Natica, species probably new, from Bell's Landing and Maryland.

Besides these, other species can be mentioned that are found in common in the Pamunkey and the Alabama Lignitic. Here may be included *Volutilithes petrosa*, var. *tuomeyi*, *Levifusus trabeatus* var., and perhaps *Cytherea ovata* Rogers, which is likely to prove the same as *C. nuttalliopsis* of Heilprin.

The fauna of the Bell's Landing sub-stage is much more varied, i. e., contains a far greater number of species than does that of the Eocene of Maryland and Virginia. As a rule, such species as survive in the later stages of this series are here represented by unusually large varieties. While those that are common to this and the Maryland and Virginia deposits are dwarfed or comparatively smaller than their northern representatives. This however, does not invariably hold true.

As far as is yet known the different horizons of the Maryland and Virginia section contain practically the same fauna, although at some localities and horizons a few forms may appear extremely abundant, while elsewhere, they may be very scarce. It is too early however to speak with much certainty on this point. The fossils, as a rule, are poorly preserved and thus far only the commoner forms have been collected and described. There are traces of many less conspicuous ones that may serve to throw additional light on this subject when their characteristics have been ascertained.

Below will be found a general section of the Eocene series of the Southern States. It is based to a considerable extent on that given by Smith and Johnson (*loc. cit.*) though modified to include and harmonize with the writer's more recent observations. The horizon of the Maryland and Virginia Eocene is moreover, indicated.



EXPLANATION OF FIGURES.

- FIGURE 1. *Turritella mortoni* var. *postmortoni* Harris, from Bell's Landing, Ala.
 " 2. The same; Aquia Creek, Va.
 " 3. *Turritella mortoni* Con., typical, from Glymont, Va.

Stages.		Substages.	
Series Eocene.	Vicksburg.	{ Coral Limestone.	
		{ Vicksburg Beds.	
		{ Red Bluff Beds.	
	Jackson.	{ Moody's Branch Beds.	
		{ Marks' Mills Red Beds.	
	Claiborne.	{ White Bluff Marls (Ark.)	
		{ Claiborne Sand.	
	Lower Claiborne.	{ <i>Ostrea sellæformis</i> Beds.	
		{ Lisbon Beds.	
	Lignitic.	{ Buhrstone.	
		{ Hatchetigbee Beds.	
		{ Wood's Bluff Beds.	
		{ Bell's Landing.	
Midway.	{ Bell's L'd'g Bed.		
	{ Gregg's L'd'g Bed.		
	{ Nanafalia Beds.		
	{ Matthew's Landing Marl.		
	{ Black Bluff Clays.		
	{ Midway Clay and Limestone.		

Substage.	{ Eocene of Maryland and Virginia.
Pamunkey.	