

ART. LX.—*An apparent Time-break between the Eocene and Chattahoochee Miocene in Southwestern Georgia; by*
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THROUGH the southwestern part of Georgia and adjacent northern Florida there extends a plateau known as the Red Clay hill region. It has a maximum altitude approximately 300 feet above the sea, and an undulating surface, with the main drainage channels cut, with steep cross profiles, to a depth of over 100 feet.

This plateau is sharply limited on the north by an often steep declivity facing the Eocene flat-land country, and consists of Miocene deposits resting on Eocene, both of which dip about 13 feet to the mile to the South. The section along the Flint River where it is cut into the flat-land country, exposes the limestone and siliceous Eocene beds abounding in Vicksburg fossils. Of these Mr. Foerste writes me, that they form "a varied fauna, including species of Operculina, Orbitoides, many corals, Cidaris, Echinocyamus, Clypeaster, Scutella, Lunulites, Ostrea, Pecten, Amusium, Spondylus, Plicatula, Cardium, Turritella, Vermetus, Xenophora, Natica, (Ampulina), Cerithium, Strombus, Cypræa, Cassidaria (Sconsia), Fulgur, Conus and fragments of claws of crabs; among these species Echinocyamus parous, Eumnus, Scutella Lyelli, Pecten Poulsoni, and unknown species of Pectunculus and Cerithium may be mentioned as especially characteristic of the Vicksburg horizon in Southwestern Georgia."

Where the Flint River cuts through the plateau at an altitude of 40 to 50 feet above the sea, it exposes the white calcareous beds of the Chattahoochee group, but without any visible contact with the underlying Eocene. As has been shown by Mr. Langdon,* the river bank is occupied by the Chattahoochee formation until its gentle southerly dip brings its upper surface below water, and under the Chipola Miocene group at Alum Bluff.

The base of the plateau is Chattahoochee. The exposures in sides of deep ravines and freshly eroded gullies in the plateau almost uniformly show only more or less sandy clays, which in the higher parts seem to be more sandy, and contain smooth pebbles of sandy iron-ore, which may be either clastic or concretionary, and also frequent pebbles of quartz, clearly derived from metamorphic schists. These quartz pebbles are often $\frac{3}{4}$ to $1\frac{1}{2}$ inches long by $\frac{1}{2}$ inch broad, with a thickness of only $\frac{1}{12}$ to $\frac{1}{8}$ inch, and so angular that it is difficult to believe

* Some Florida Miocene, this Journal, October, 1889. Variations in the Cretaceous and Tertiary Strata of Alabama, Bull. Geol. Soc. Am., vol. ii, July, 1891.

that they have been transported very far. The only light obtained thus far as to the age of the upper part of the plateau is found in extensive areas of residuary fossiliferous angular fragments, representing broken-up siliceous beds. These occur at numerous points on the plateau at altitudes of 230 to 260 feet above the sea, and seem to belong below the ferruginous sand with iron ore pebbles. These fragments up to several cubic feet in size, are found covering the surface in areas of many acres in extent, and also imbedded in the underlying clays. At one locality, which we were accustomed to call Gasteropod gully, near Roseland plantation, southeast of Bainbridge, the range exposed between the fragments on the surface, and those in the clays in the adjacent gullies is as much as 60 feet or more, although under the circumstances the true relation between the upper and lower fragments is not apparent. These fragments consist of silicified beach-worn shells which either make up almost the whole rock or are imbedded in the sandstone. The fossils are of Chipola Miocene Age. Of these Mr. Foerste sends me the following list from his determinations.

"*Ostrea divaricata*, var., *Pecten Madisonianus* *Arca idonea*, *Carditamera?* *protracta*, *Venus mercenaria*, var., *Strigilla flexuosa*, *Mactra subcuneata*, *Solen ensis*, *Conus planiceps*, *Drillia* similar to *lunata*, *Melongena* similar to *subcoronata*, *Typhis acuticostata*, var. *typhis* similar to *gracilis*, *Turritella gatunensis*, *Turritella* with an ornamentation similar to *T. acropora*, but shell is larger, *T.?* *terebriformis*, *Solarium bellastratum*, var. *Vicksburgense*, a moderate variation from the same. *Crucibulum auricula* var. *?* *imbricatum*, *Calyptræa centralis*, *Crepidula fornicata*, *Natica floridana*, *Chlorostoma* (*Omphalius*) *?* *exoletum*, *Helix adaunis*, var. *Bulinulus?* *Balanus?*

As stated above the surface of the plateau is generally undulating. Wherever it has been exposed to cultivation deep gullies have rapidly cut their way back into it. These facts would incline one to look upon the plateau as a Miocene island area covered and levelled up with a much more recent sand formation. The younger sands may however be of Miocene age like those above the Chipola and Ecphora beds at Alum Bluff. And they may have been continuously protected from erosion by the density of vegetation and the porosity of the rocks which permitted the downward drainage, into subterranean channels, which is still active throughout the region. This last alternative accords with the view expressed by Mr. A. F. Foerste,* that these sands represent the shoreward extension of the Chipola and Chesapeake formations.

The evidence for a time break between the Eocene and Chattahoochee Miocene consists in :

* Chipola Miocene of Bainbridge, Ga., and Alum Bluff, Fla. This Journal, Oct., 1893.

I. The almost general presence of a limestone conglomerate at the base of the Chattahoochee, immediately overlying Eocene fossils. This conglomerate is sometimes a breccia, and often like a rock shattered in place; but more often it consists of clearly rolled pebbles of limestone not distinguishable from the Eocene rock below.

II. The surface of demarcation between the Eocene and Chattahoochee is very irregular. The Eocene rises island-like into the Miocene. The altitude of the contact differs considerably at points but a few miles apart along the strike. Thus the contact is

180 feet above the sea on Griffin's Creek.

102 feet above the sea in Glenn's Well, $2\frac{1}{2}$ miles eastward.

155 feet above the sea in Powell's limesink, still farther east.

Mr. Foerste writes me that the fossils at Griffin's Creek correspond with those found in the upper part of the Chattahoochee, while those at Glenn's Well, and Powell's limesink correspond with those belonging in the lower half of the Chattahoochee.

At numerous points in southwestern Georgia there occur between the Eocene and Chattahoochee, masses of columnar corals chalcodonized. They are not present at the majority of the points of observed contact. Nor has their exact relation to the Eocene or Chattahoochee been observed. Mr. Dall writes me regarding some that I sent him, that they belong at the base of the Miocene. The observations lead me to think that they probably grew during the interval between the Vicksburgh and Chattahoochee, upon the submerged Eocene surface.

Mr. Alexander Agassiz, in "The three Cruises of the Blake," has called attention to the influence of submerged ridges and plateaux upon the growth of organic formations.

It seems possible that during Miocene time the present plateau of southern Georgia was outlined by submerged islands of the Eocene limestone. The Gulf Stream after the creation of the Central American barrier, found its way back to the Atlantic sweeping over southern Georgia and northern Florida, and supplying the food needed to build up the great organic beds of the Chattahoochee and Chipola.

As these grew to the surface they formed islands which would explain the presence of the land shells found in the Bainbridge Chipola, and also the beach-worn character of the Chipola fossils at the same locality. And the lower flat-land country of central Georgia may represent the contemporaneous course of the cold current, carrying less pure water, and less of the nutriment needed to build up organic deposits.