

The epochs of the marine Miocene, as defined from the formations of the Atlantic and Gulf borders, are as follows :—

1. **CHATTahoochee** : so named by Langdon, from typical exposures on Chattahoochee River, southwest Georgia, and northwest Florida. Dall correlates with the *Chattahoochee* deposits the *Hawthorn beds* of central Florida, consisting of phosphatic oölyte, ferruginous gravel, and green clays, the *Orthaulax bed* and *Tampa limestone* at Tampa, the *Altamaha grits* of Georgia, and also the “typical *Grand Gulf*” of southern Alabama. The last-named deposits are placed at this horizon because they are “analogous to and probably synchronous” with the *Altamaha grits* of Georgia, and are overlaid at Roberts, Escambia County, Fla. (according to Smith), by a bed containing Chipola fossils, as identified by Dall. The Chattahoochee fauna is closely related to the Miocene of West Indies, Jamaica, Trinidad, Haiti, Curaçoa, Panama, and Costa Rica (Dall).

2. **CHIPOLA** : distinguished by Burns, and first named by him in manuscript as the *Chipola formation* from typical exposures on a river by that name in northwestern Florida. The lower member of the group, the *Chipola sands*, is famous for its vast number of fossil shells, nearly 400 species having been found at the type locality. This remarkable faunal development is to the Miocene what the Claiborne fauna is to the Eocene ; both occur in slightly ferruginous sands about 16' thick, both appear to be very limited in areal extent, and both occur medially in their respective periods.

The fauna of the *Alum Bluff sands* (Dall) immediately overlying the fossiliferous Chipola bed has not been carefully studied.

All these older Miocene deposits are characterized by a warm-water or subtropical fauna (Dall).

3. **YORKTOWN** : named from Yorktown, Va., by Dana (1863). It is the time-equivalent of the Chesapeake group of Darton and Dall (1891). It includes the Miocene of the Atlantic slope as known to geologists prior to 1887. The section at Alum Bluff shows that this group lies above the Chipola. It is well developed in Duplin County, N. C., at Yorktown, and elsewhere in Virginia, and along the river courses in Maryland. Calvert Cliffs on the west shore of Chesapeake Bay exhibit three well-defined fossiliferous zones, named, in descending order, the St. Mary's, Jones Wharf, and Plum Point. Beds lower still in the series are found on the eastern shore of Maryland, and with these in New Jersey Dall finds traces of older Miocene fossils. It has been identified by its fossils on Martha's Vineyard by Dall.

A modification of this fauna is found in the Galveston Deep Well, Tex., between depths of 2000' and 3000'.

Since the publication of Gabb's work on the California Geological Survey the Miocene as well as Pliocene fossil remains of the Pacific slope have received little attention. As a rule the Miocene fossils are poorly preserved, and are often embedded in firm rock. Their general aspect indicates a horizon more nearly that of the *Yorktown group* than that of the older Miocene.

In Georgia and Florida, where newest Eocene and oldest Miocene occur, there is a marked faunal break between the two, yet there are several species in common. In Maryland and Virginia, where Yorktown Miocene rests upon Lignitic Eocene, the break is complete, not one species being found common to the two. The upper, or Yorktown, Miocene was characterized by a fauna indicative of a temperature similar to that of to-day.

The *Ashley marl bed* of South Carolina, containing phosphatic nodules with fossils in them, which was referred by Tuomey doubtfully to the Eocene, affords Miocene fossils (1894). Of *marine Pliocene*, there are the *Floridian* deposits of Heilprin as modified by Dall (1892); the *Pliocene* of Tuomey (1848), excluding some Miocene beds as determined by the investigations of C. W. Johnson and Dall. To this period have been referred the *Orange sand group* of Safford (1856), occurring in Tennessee, the *Orange sand* of Hilgard (1860), in Mississippi and Tennessee, the *Orange sand*, or *Lagrange*