II. DISCUSSION OF THE TYPE SECTION OF THE CLAYTON FORMATION OF ALABAMA

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Fluegeman (1989) describes a lithologic section consisting of sands and clays as the lithostratotype of the Clayton Formation of Alabama, rather than a predominantly limestone section as described by Reimers (1986) (figure 1). The section given by Fluegeman contains only a single one meter unit of limestone and seems to be the same section described by Reinhardt and Gibson (1980) (figure 2). Any section that is termed a lithostratotype or type section must be compared to the original type section, as described by the original author. In order to resolve which section (that of Reimers or Fluegeman) is the type section, the original type description was consulted. Neither Fluegeman (1989) or Reinhardt and Gibson refer to the original reference or any other early descriptions of the type Clayton.

In Smith *et al.* (1894) the lowermost Tertiary near Clayton, Alabama, is named the Clayton Limestone. This reference states that the section is in a railroad cut near Clayton and is described as ten to fifteen feet of dark blue, nearly black clays overlying five to six feet of limestone. The exact location is not given. Smith *et al.* further describe the limestone as a hard, almost crystalline limestone with grains of quartz. Reimers' section (figure 1) shows a tan, massive limestone unit 16 feet (4.9 m) thick with thinner sand and clay units at the bottom. The upper portion of Reimers' section was covered. The Fluegeman and Reinhardt and Gibson sections show only a one meter unit of sandy limestone within the section. Both make mention of a thin clay bed with abundant leaves. Smith *et al.* make no mention of this bed in the original description.

Other references also describe a section of limestone as being a typical Clayton section or as a type section (MacNeil 1946, Cooke 1926, Hastings and Toulmin, 1963, etc.) These include field trip guidebooks as well as reports on the geology and stratigraphy of Alabama. The Alabama Geological Survey regards the limestone section as being the typical section of the Clayton Formation and closer in description to the original section than any other exposures (Mancini, personal communication).

Further clarification of the location and description of a type section of the Clayton is provided by the Gulf Coast Association of Geological Societies' (1970) type localities project. In the type locality description of the Clayton Formation, the type locality is given as that described by Smith *et al.* This is the railroad cut east of Clayton. The section given by this project is shown in figure 3, which shows the Clayton as sand overlain by massive fine

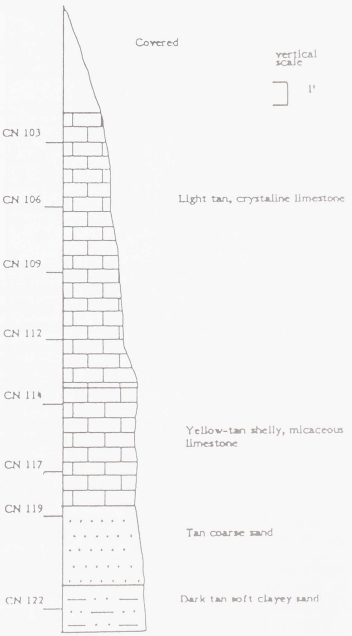

Figure 1. Stratigraphic section of the Clayton Formation. (From Reimers, 1986).

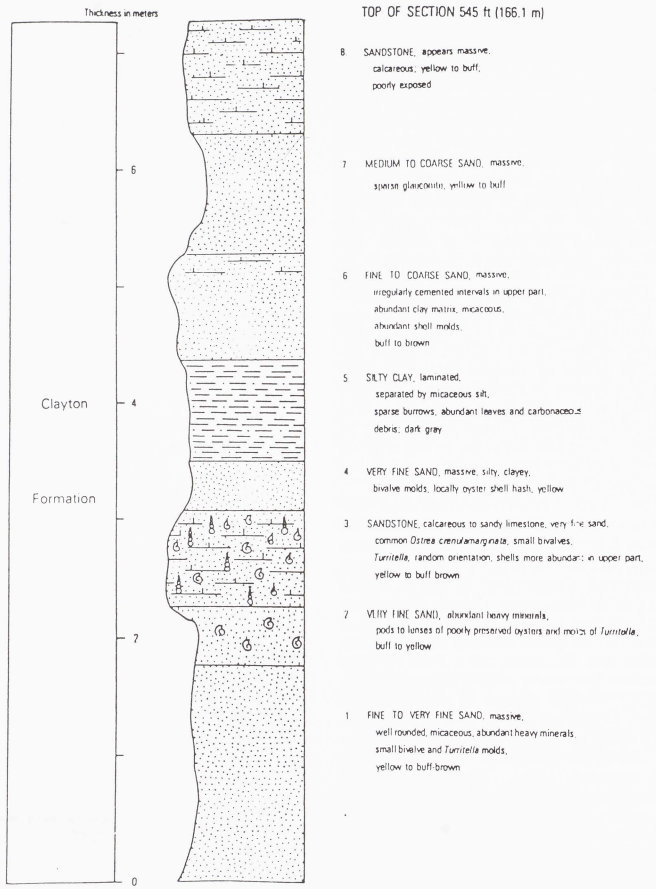

Figure 2. Stratigraphic section of the Clayton Formation. (From Reinhardt and Gibson, 1980).

sandy limestone. This description is similar to that of Reimers, and unlike that of Fluegeman or Reinhardt and Gibson.

Figure 4 shows the entire GCAGS type locality project map and sections. Note the second section, which is northeast of the typical limestone section of the Clayton. This second section is very similar to the Fluegeman section, including a thin limestone unit and a siltstone unit containing leaves. This figure shows the limestone unit as Clayton and the second section as Nanafalia Formation resting above an unconformity on the Clayton. This unconformity may have been overlooked by Fluegeman and Reinhardt and Gibson, if

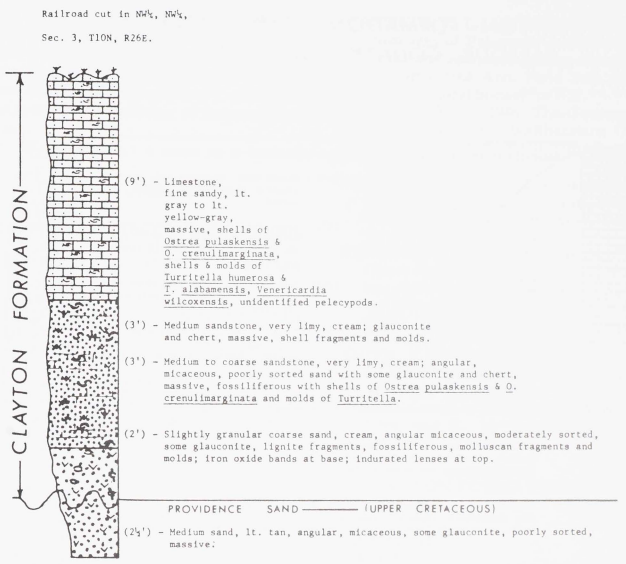

Figure 3. Stratigraphic section of the Clayton Formation. (From Gulf Coast Association of Geological Societies, 1970).

this is the same section as that described by them. Regardless of the unit name assigned to the second section, this sequence cannot be regarded as the type section of the Clayton Formation, because the type section was originally described as containing a thick limestone unit. Since the exact location of the original limestone section is not known, a section as similar as possible to the type locality must be used as the reference section for the Clayton. Though the Reimers, Fluegeman, and Reinhardt and Gibson sections are in the type locality area, the Reimers section must be the reference section, based on these facts: 1) it contains the massive limestone described in the original reference by Smith *et al.;* 2) it is the same section described by the GCAGS type section project; 3) it is used by the Alabama Geological Survey as the reference section; and 4) it is close in description to the Clayton Formation sections as given in other references.

With the type section then containing a limestone unit and such a unit being described by Reimers and the GCAGS, the question must be answered as to which stratigraphic unit the Fluegeman, Reinhardt and Gibson, and the second GCAGS sections belong. If the three are the same or at least in close proximity to one another, they can be Nanafalia as given in the GCAGS project. A more plausible explanation can be found in Cooke (1926). In a description of the Cenozoic beds of Alabama, the Clayton is described as clay, sandy limestone, and limestone; however, all gradations from hard limestone through sandy limestone and calcareous sandstone to loose quartz sand are found. The change from limestone to sand may take place within a few feet either up or down or sideways. Adams (personal communication) concurs with the observation that the sandstone sections can be seen to develop over short lateral dis-

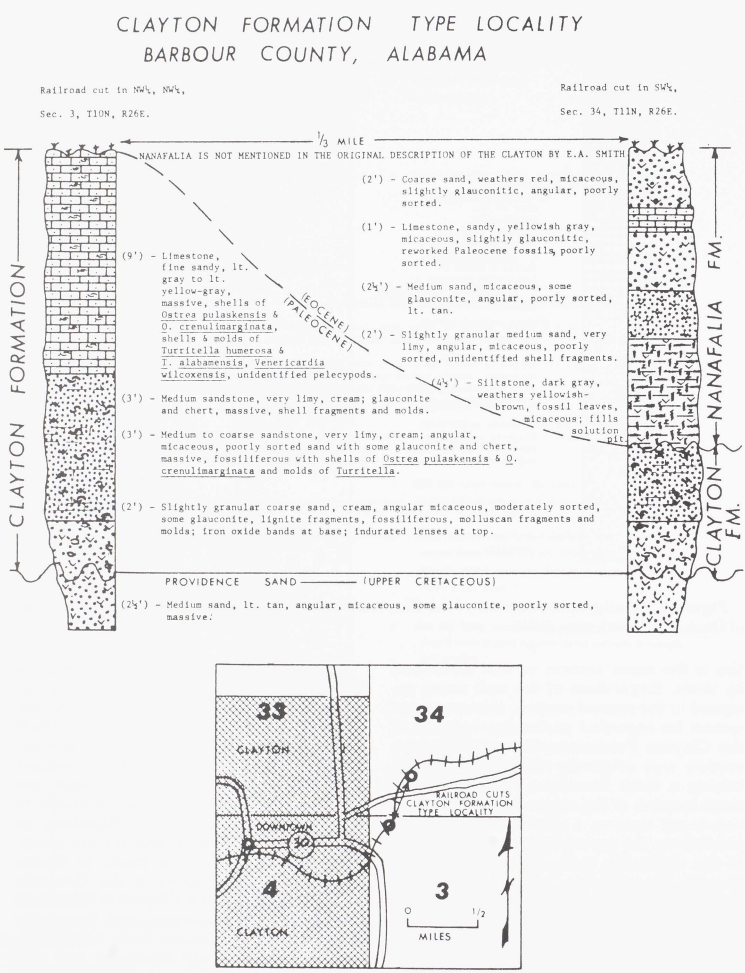

Figure 4. Map and two stratigraphic sections of the Clayton Formation. (From Gulf Coast Association of Geological Societies, 1970).

tances. The Fluegeman section is probably a sandy facies of the Clayton, with the section given by Reimers the equivalent of the limestone described in the original type reference and, thus, it must serve as a lithostratotype rather than any of the sand/clay sections.

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III. THE TYPE SECTION OF THE CLAYTON FORMATION OF ALABAMA: A REPLY

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I am very grateful to David D. Reimers for the discussion of my paper (Fluegeman, 1989) on the Clayton Formation lithostratotype. It is clear from his discussion and from my own work that there is some ambiguity as to the interpretation of the type section of the Clayton Formation. I wish to address a few points raised by Reimers about the type section of the Clayton Formation.

The purpose of my paper was to point out what I considered a discrepancy in the type section of the Clayton Formation described by Reimers (1986) when compared with the section designated as the lithostratotype of the Clayton Formation by Reinhardt and Gibson (1980). A full literature review of the Clayton Formation was not included in that paper, as I considered the section I used to be clearly the type section. My conclusion was based on the early work as well as the data presented by Reinhardt and Gibson (1980) from a nearby corehole.

The first use of the name Clayton was not Smith *et al.* (1894), as reported by Reimers, but by Langdon (1891). This study does not, however, shed any light on the nature of the Clayton Formation away from the Chattahoochee Valley. Smith *et al.* do provide a description of a section in the railroad cut near Clayton but it includes 10 to 15 feet (3 to 4.5 m) of clay overlying 5 to 6 feet (1.5 to 1.8 m) of limestone. The upper portion of this section must be the clay unit designated as the Porters Creek outlier by Reinhardt and Gibson, and as such, the Clayton Formation described by Smith *et al.* includes only the upper part of the Clayton Formation. The section of the Clayton Formation described by MacNeil (1946) appears to include the section described by Smith *et al.* but adds a section of sands and some limestones below it.

As anyone who has visted the railroad cut at Clayton knows, there are two railroad cut sections. Despite the assertion of Reimers that the section south of the railroad crossing was designated by the Gulf