SOUTHEASTERN GEOLOGICAL SOCIETY

FIFTH FIELD TRIP

WEST CENTRAL FLORIDA

DEC. 5, 6, 1947
SOUTHEASTERN GEOLOGICAL SOCIETY
Tallahassee, Florida

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FIFTH FIELD TRIP

Portion of Central Florida - Gulf Coast
December 5, 6, 1947

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ACKNOWLEDGMENTS

The Southeastern Geological Society extends sincere thanks to the Field Trip Committee, and especially to Dr. R. O. Vernon who made possible this very instructive trip into the area which he has been mapping in detail for the Florida Geological Survey. We are indebted to him for the excellent descriptions of beds exposed at each locality, for the general description of the formations exposed in the field trip area, and to him, Dr. H. B. Stenzel, of the University of Texas, and Dr. H. G. Naegeli, of the Florida Geological Survey, for fossil determinations.

Thanks are extended to J. E. Banks for his accurate description of the pre-Avon Park formations of the area.

The Florida Geological Survey, Dr. Herman Gunter, Director, has co-operated in every way to make our Fifth Field Trip successful.
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ITINERARY

The first day's trip will start at 10:00 A.M. on Friday, December 5, 1947 from the Gulf Filling Station at Fanning Springs, Levy County, U. S. Highway 19 will be followed south toward Crystal River in Citrus County. Lunch will be taken at about 1:30 P.M. after stop 4 has been completed, at the Gulf Hammock Hotel as guests of Mr. Robert B. Campbell, consulting geologist. If cars start with a full tank, sufficient gas will be available for the complete trip.

The first day's trip will end at stop 7 on the Withlacoochee River at Inglis, and the night will be spent at adjacent towns. The Izaak Walton Lodge in Yankeetown can house and feed about 20 people. Twelve can stay at the Park View Hotel in Dunnellon, food can be had at the Park View Cafe on the ground floor of the hotel. Additional sleeping quarters will have to be obtained at cottages on U. S. Highway 19. Food for those in cottages can be gotten at the Izaak Walton Lodge. The costs of room and meals (dinner and breakfast) will be about four dollars for each person. Please contact R. O. Vernon, E. H. Rainwater and Glen Walter for sleeping accommodations.

The second day starts at the Izaak Walton Lodge promptly at 7:30 A.M. and the route is on State road 484, U. S. Highway 19 to Crystal River, State road 44 to Inverness, and north on U. S. Highway 41. The day ends at stop 20 in Williston. Lunch will be provided at a cost of one dollar and fifty cents per person at the Rainbow Lodge, stop 19, where Mr. H. H. Cooper, Jr., will give a talk on the hydrology of Florida's underground water.
ROAD LOG
by
E. H. Rainwater with geologic sections by R. O. Vernon

First Day

Mileage

0.0  Fanning Springs, Levy County, Florida. Gulf service station, and restaurant, on U. S. Highway 19, just south of Suwannee River, 13 miles southeast of Cross City, 9 miles north of Chiefland. Follow U. S. Highway 19 south to Gulf Hammock.

0.2  Railroad crossing. Ocala limestone in sink on right.

0.4  Junction with Fla. Highway 26 (to Gainesville) on left.

3.0  Note: The area between here and Chiefland (6 miles to the south) is underlain by Ocala limestone, with a thin cover of soil and sand. The topography is gently rolling. This is one of the farming areas of Levy County.

6.3  Ocala limestone exposed in road ditch on left.

6.7  Abandoned quarry in Ocala limestone, in field on right.

8.3  Ocala limestone in small road cut.

9.1  Railroad crossing, Chiefland.

9.2  Fla. Highway 345, to Cedar Keys, on right. Straight ahead.

10.4  Ocala escarpment. This is approximately the southern limit of Ocala limestone in this part of Levy County. The red material in shallow road cuts along here is weathered Pleistocene marl.

10.9  Long Pond on right.

12.0  STOP #1.

Late Pleistocene Sands and Marl

In drainage ditch emptying into Long Pond in SW\(\frac{1}{4}\) of NW\(\frac{1}{4}\), Sec. 17, T12S, R15E on U. S. highway 19.

Top

Bed  Feet

1  4.1  Mottled red and gray sand, sandy clay, clay and blocky, silty clay, somewhat weathered and containing gray streaks of almost pure kaolinitic quartz sand.
2  0.5 Chocolate brown, very argillaceous clay containing fragments of turtle shells, bones and oysters. The oysters are questionably in place.

3  1.9 Purple-gray, very sandy, shell marl containing Polinices duplicata, Planorbis cf. P. disstoni, Physa meigsii, Terebra sp., and others, and several brackish water ostracode genera including Cytheridella (Metacypris?).

4  1.5 Gray, argillaceous, well sorted, quartz sand. The bed is believed to extend downward to pinnacles of limestone. The sand grades laterally and upward into bed 3 and is coarser toward the base.

NOTE: A fault passes through Long Pond. Ocala limestone underlies the higher area to the west, but the area to the east is low lying and only Pleistocene sands and marls are exposed.

Mileage

12.5 Pleistocene in pit on right.

14.2 Limestone boulders of Periarchus beds in drainage ditch.

14.6 Village of Usher. Note: Otter Creek (stream), about one mile west of the highway, has a straight course which may have been partially determined by faulting.

17.3 Note: Abundant exposures of limestone and dolomite of the Periarchus bed in this area.

20.6 Bridge over tributary of Otter Creek.

21.0 Village of Otter Creek. Cross Fla. Highway 24. Note: Pleistocene white sandy limestone or calcareous sandstone is exposed in Otter Creek (stream) about one mile to the west.

23.3 Pleistocene white sand in pit on right.
Pleistocene shell marl and sand and dolomite of the Middle Eocene(?)

Exposed along a possible fault zone in a drainage canal crossing Road 55 in the NW\textsubscript{4} of the SE\textsubscript{1}, Sec. 6, T16S, R16E - Section made 100 feet down stream from the highway bridge on the right bank.

Twenty-three inches of tan to brown, massive, porous, finely crystalline ("silty"), somewhat platy dolomite containing \textit{Peneroplid} sp. "A", some eel grass(?), and impressions of many miliolid molds is exposed. This bed is cut by many solution cavities which are filled by very sandy, dolomitized, tan to gray shell marl and sand containing abundant Pleistocene shells, including \textit{Chione cancellata} and \textit{Venus} sp., \textit{Arca scalarina}, and many others. This marl and sand, locally indurated, grades upward into about two feet of light-gray, argillaceous, fine to medium, coquina, quartz sand, containing fossils above. Overlying this bed is an irregular thickness of red, leached, argillaceous sand. Progressively downstream the percentage of Pleistocene deposits in the stream banks increases and two-tenths mile downstream on the left bank spoil banks are made up entirely of Pleistocene deposits, from which good collections can be made.

Bridge. Dolomite is exposed along stream west of Highway.

The type locality of the Gulf Hammock formation exposed along the drainage canal, the modified Wacassa River, in the SW\textsubscript{4} of the SW\textsubscript{1}, Sec. 21, T16S, R16E, below the bridge on Road 55. Section made August 10, 1947.
1 2.5 Gray, fine to medium, argillaceous, quartz sand carbonaceous soil zone.

2 2.8 Tan to brown, dense, massive, poorly fossiliferous, hard ledge of dolomite containing rare mollusk molds and Cassidulus sp. "b" found in the lower Periarchus beds.

3 1.3 Tan, very soft, very friable, thin bedded but not laminated, dense, finely crystalline ("silty") dolomite. Fossils are rare and none has been determined.

4 0.3 to 0.9 Tan to brown, fairly hard, porous, massive dolomite. The porosity is almost entirely molds of mollusks.

5 0.7 and extending at least two feet below water level - Tan to brown, porous, fairly soft, finely crystalline ("silty"), poorly fossiliferous dolomite.

NOTE: The whole section is presumed to be Periarchus beds but the lower part may be Middle Eocene. The upper three beds are certainly Periarchus beds (dolomitized). Fossil casts from bed 4 have been sent to Dr. H. B. Stenzel of The University of Texas, for identification.

Mileage

25.6 Dolomite with a large undescribed peneroplid foraminifer on right.

26.9 North city limits of Gulf Hammock.

27.0 Dolomite exposed in road ditch on left.

27.2 Wekiva River bridge.

27.25 Turn right onto black top road.

27.4 Road fork. Keep to left.
Mileage

27.6 Bridge over tributary of Wekiva River.
28.8 Magnolia tree arched over road.
28.9 Entrance to Peek's Camp on right. Continue straight ahead on black top road.
29.2 Road by fence on right leads to Wekiva River, about 0.2 mile, where dolomite and limestone of the Periarchus bed are exposed. A hotel, destroyed by fire, was built on the banks of the Wekiva River at this locality.
29.5 End of black top road. Turn right onto woods road.
29.8 House on right.
30.1 Park cars in old field, and walk north, around wire fence, about 300 yards to Sulphur Springs Landing on the Wekiva River. STOP #4.

Beds of Middle Eocene (Avon Park limestone)

At Sulphur Springs Landing on the left bank of the Wekiva River in the NW ¼ of the SW ¼, Sec. 32, T14S, R16E. Section made September, 1946.

Bed Feet
1  4.0 (variable) Mottled cream to gray, very soft, granular, massive, weathered limestone topped by blocky, red, sandy, clay soils, that extend back into a cultivated field.
2  1.0 to 1.6 Cream to white mottled, hard ledge, dense, very fossiliferous limestone containing excellent specimen of Peneroplid sp. "A" and associated Avon Park limestone foraminifera. Mollusks are present as molds and compare favorably with those of the Periarchus bed. These species do not extend generally into the Ocala limestone.
3  3.0 (to water level) Same lithology as above but softer and with hard nodules.

NOTE: This outcrop is bounded by hard, dolomitic limestone shoals up and down stream. These shoals contain a similar fauna and the area from the town of Gulf Hammock west to the downstream shoal is underlain by beds of the Middle Eocene.

33.3 Dolomite with Coskinolina and Dictyoconus sections exposed in road ditch on right.

33.6 Peek's grocery on right.

34.5 Bridge. Dolomite exposed in drainage ditch.

34.7 Limestone boulders of Periarchus bed by road.

35.1 Dolomite exposed in abandoned quarry on right.

35.3 STOP #5.

Periarchus bed.

Road metal pit southwest of Road 55 in SW_1/4 Sec. 34, T14S, R16E.

This pit exposes dolomite in the northeast corner and a typical limestone of the Periarchus bed, very indurated and possibly silicified locally. The dolomite is believed, from core hole studies, to be dolomitized Periarchus limestone although fossils have not been found in it. This is the best collection of Periarchus bed mollusks in the area as they are well preserved in the indurated limestone boulders piled about the pit.

Dr. H. B. Stenzel has identified the following fossils from the limestone boulders at this locality:

CRUSTACEA:

Callianassa n. sp., many claws of this mud shrimp are present. They are the most common fossil species of the lot.

MOLLUSCA, GASTROPODA:

Lapparia n. sp. This species shows no relation to L. pacilis Conrad from the Gosport sand nor to any of the Lower Claibornian species. It is close to L. dumosa exigua Palmer from the Moodys Branch marl, but it is a distinctly different species.

?Crommium sp. Might be C. perovatum (Conrad) from the Gosport sand or C. jacksonense (Harris) from the Moodys marl; it is apparently nearer to C. jacksonense on
account of its well defined shoulder.

_Caricella_ n. sp. Spire even lower than in _C. doliata_ Conrad from the Gosport sand, general shell outline as in _doliata_, but with strong plus regular cancellate sculpture. The Gosport sand _Caricellas_ are all non-cancellate; the Moodys Branch marl has a cancellate species.

_Calyptroæa alta_ (Conrad) (Moodys Branch marl species).

_Scanhander_ n. sp. Slenderer than _S. jacksonensis_ Harris from the Moodys Branch marl.

_Tornus_ or _Omalaxis_ n. sp.

_Turritella carinata_ Lea Gosport species.

_Cerithium_ spp. 2 of 3 species.

_MOLLUSCA, PELECYPODA:_

_Coris claibornensis_ Dall Gosport species.

_Crassatella_ sp.

_Corbula_ (Caryocorbula) _densata_ Conrad or _alabamiensis tecla_ De Gregorio. The two are so nearly identical that it is impossible to separate the Moodys Branch from the Gosport species.

_Venericardia_ cf. _V. diversidentata_ Meyer

(?) Moodys Marl species?

_Trachycardium_ or _Trigonocardia_ n. sp.

_CNIDARIA, HEXACORALLIA:_

_Platytrochus_ or _Sphenotrochus_ sp. Both genera are unknown from the Jackson.

_Mileage_

35.3 Limestone boulders of _Periarchus_ bed on left.

35.9 Bridge over drainage ditch.

36.0 Borrow pit on right exposes limestone of _Periarchus_ bed and the underlying dolomite.

36.2 Bridge over Cow Creek. The limestone-dolomite contact of _Periarchus_ bed is exposed a short distance down the creek.

36.8 Borrow pit in dolomite on right.
Mileage

37.0 Bridge over drainage ditch. Dolomitized limestone exposed in the ditch in a small fold.

37.3 Alternate STOP. Limestone and underlying dolomite of Periarchus bed exposed in pit on right.

38.0 Limestone boulders of Periarchus bed in drainage ditch.

38.0 - 40.0 Limestone boulders of Periarchus bed in woods on either side of road.


41.5 Bridge over drainage ditch. Pleistocene sandy limestone exposed in ditch about 100 yards to right.

43.4 Bridge. Small sink on right exposes Pleistocene sandy limestone.

45.2 Turn right onto sand road to Lebanon quarry.

45.9 STOP #6.

Periarchus bed and deposits of the Middle Eocene (?) (Avon Park limestone)

New Lebanon Dolomite Pit in SW^1_4 of NE^1_4, Sec. 12, T16S, R16E. Section made in the middle of the pit on east side, December 14, 1946. There is an apparent dip of 6 degrees south so that beds in the south end of the pit are younger and beds in the north end are older than the beds at the surface in the section below. The section exposed is therefore thicker than given.

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White to gray, fine, argillaceous, quartz sand.

Tan, dense, hard, massive dolomite containing scattered molds of foraminifera and broken mollusks.

Tan, very soft, friable, finely crystalline ("silty"), porous to dense, thin bedded dolomite. Local areas are extremely platy and laminated by alternate layers of dolomite and plant remains. Large massive dolomite layers alternate with laminated beds.
and some questionable laminated pebbles were noted.

The base is dark brown, is heavily laminated and contains thin beds of peat. *Peneroplid "A", Coskinolina - Dictyoconus* sections are present.

Tan to brownish-gray, dense, fine grained dolomite, showing numerous long, narrow borings presumed to be made by worms or boring mollusks and many molds of *Cerithium* sp., which Stenzel says is new. This bed is the upper portion of Bed 5 and is locally absent.

Brownish-gray, purple-tinted, very dense, finely crystalline, lithographic dolomite. Beds 4 and 5 grade laterally and vertically into Bed 6 or where it is absent into Bed 7.

Brown to greenish-gray, very pure, thin bedded, dense, carbonate clay. This bed has the consistency of clay when wet and will analyze 95 to 98 per cent carbonate. On drying the material "sets up" like lime. The bed is laminated by organic remains, thin peat beds in places, and by a pavement like bryozoa. It contains an abundant and beautifully preserved foraminiferal fauna of Avon Park characteristics and includes *Elphidium* sp., *"A", Coskinolina floridana* Cole, *Dictyoconus cookei* (Moberg) in great abundance, and an Ostracode fauna that has been described by Dr. H. V. Howe of Louisiana State University, and will be published by the Florida Geological Survey.

Brownish-gray to brown, purple-tinted, hard to soft, granular, massive-bedded, porous limestone containing many well preserved mollusk molds, large miliolids, *Coskinolina*, *Dictyoconus*. 
Peneroplid sp. "A", and Elphidium "A". From this bed H. B. Stenzel has identified the following forms:

*Corbis claibornensis* Dall Gosport species.  
Same as at stop 5

*Trachycardium* or *Trigonocardia* n. sp.

*Cerithium* n. sp.

*Ectinochilus* n. sp.

*Clavilithis columbaris* Aldrich (a Cook Mountain species)

Hexacoral, genus indef.

**NOTE:** On November 15, 1947 boulders of dolomitized limestone containing some species of the fauna above and a large clam known to be present in the *Periarchus* bed were thrown out of the pit. The contact of the *Periarchus* bed with the underlying Middle Edocene could not be definitely placed at the time the section was made but is believed to be in Bed 3.

**Mileage**

46.7 Turn right onto U. S. Highway 19.

47.8 Pit in dolomite on left. Limestone boulders of the *Periarchus* bed on surface.

48.4 Note descent from higher terrace to lower one.

48.8 Small stream with 2 to 3 feet of dolomite exposed.

48.9 Pit on left with dolomite and limestone of the *Periarchus* bed.

49.8 Limestone boulders and ledges of the *Periarchus* bed along highway.

51.9 Pit on right exposes the *Periarchus* bed.  
Note: Pine and palmetto are the dominant plants in areas, as the one ahead, underlain by limestone, whereas broad leaf trees and shrubs are characteristic of the dolomite areas.

52.2 Pit on right exposes limestone of the *Periarchus* bed.

52.5 Turn right onto sand road.

52.8 Turn right onto black top road, to Yankeetown.
Mileage

53.3 Turn left onto sand road which leads to banks of Withlacoochee River.
53.5 Keep to right, by house.
53.7 STOP #7.

**Periarchus** bed

About 1/3 mile below the Florida Power Corporation plant at Inglis on the right bank of the Withlacoochee River in SE_{4} of NW_{4}, Sec. 3, T17S, R16E.

About 5.0 feet of cream to tan, soft porous, but case hardened and densely crystalline where weathered, massive, granular, miliolid limestone. A typical Periarchus limestone facies containing numerous echinoids (*particularly* *Eupatagus Mottcanus*)

Pilsbry, *Periarchus lyelli* (Conrad) var. and associated forams is exposed along the stream banks.

The channel has recently been deepened and the contact of the limestone with the underlying dolomite has been penetrated.

Boulders and ledges of the following can be seen along the banks:

1) Gray, granular limestone as exposed along the river banks.

2) Cream colored, soft, granular, porous miliolid limestone with specimen of *Veletea floridanus* Richards, a large clam, *Periarchus lyelli* (Conrad) var. and buck shot miliolids.

3) Mottled gray and brown, porous, finely crystalline, massive, sugary dolomite. Rare molds of mollusks and *Periarchus* are present.

**NOTE:** Across the river in channel dredgings one *Aturia* sp. was found, associated with *Periarchus* bed fauna.

Dr. H. B. Stenzel identified the following forms from Bed 2:

- *Cerithium* n. sp.
- *Xenophora* sp.
- *Turritella carinata* Lea
- *Crassatella ? flexura* Conrad
- *Trachycardium* or *Trigonocardia* n. sp.
- *Corbula* as at stop 5
53.9 Take left fork just beyond house.

54.1 Turn left onto black top (Yankeetown) road.

54.3 Pit with limestone of Periarchus bed on right.

54.5 Crackertown. Note: School on right and church on left made of limestone boulders of Periarchus bed.

56.9 Izaak Walton Lodge, Yankeetown.

Please see R. O. Vernon, E. H. Rainwater and Glen Walter for lodging arrangements.
Second Day

Mileage

0.0 Izaak Walton Lodge, Yankeetown.
2.4 Crackertown.
3.9 Boulders of lower Ocala limestone and limestone of the Periarchus bed with abundant shrimp claws.
5.4 Limestone of Periarchus bed exposed in small stream which follows base of terrace escarpment.
6.2 Turn right onto sand road to power dam.

Periarchus bed and Avon Park Limestone

Generalized section at stop 8 at the dam of the Florida Power Corporation in the SW¼ of SW¼, Sec. 8, T17S, R17E.

Section at A

Top
Bed Feet

Periarchus bed

1 1.0 Tan, moldy, very soft, finely crystalline ("silty"), massive dolomite containing abundant foram and mollusk molds. Coskinolina sections and molds of Barnacle, Periarchus lyelli (Conrad) var., shrimp claws noted.
Bed Feet

2  1.9 Similar material containing abundant molds of mollusks, *Periarchus lyelli* (Conrad) var., *Cassidulus* sp "B", and containing pebbles of laminated dolomite, the laminations being formed by differing colors and textures of dolomite. Nodular concretions of hard, brown to gray, crystalline dolomitic limestone are abundant. Crab claws, *Lituonella, Coskinolina, Peneroplid "A",* and buck shot miliolids, have been identified. This bed grades down into

3  2.2 Tan, soft, finely crystalline ("silty"), massive dolomite containing many mollusk molds. The bottom portion contains boulders and pebbles of tan, laminated "silty" dolomite and many oxidized concretions.

unconformity
Avon Park limestone

very irregular contact

4  1.4 to water level - Soft, tan, finely crystalline ("silty"), platy dolomite, laminated with black eel (?) grass, organic remains and by different colors and textures of dolomite. The top has many laminated, brown to tan concretions, some of which appear to be worm borings. Molds of *Coskinolina* sp., *Lituonella* sp.,

*Peneroplid* sp. "A" were identified.

5  1.5 Above material clearly visible below water.

NOTE: Downstream from this section an additional exposure (about 15 inches) of the platy dolomite of beds 4 and 5 is exposed, and appears to be a high area covered by younger beds.
Section at B

Top

Bed Feet

1 1.0 Thin-bedded, tan, soft, finely crystalline, porous dolomite containing Cassidulus sp. "C" and Periarchus lyelli (Conrad) var.


The whole section is topped and crevices are filled with fresh water Pleistocene marl and downstream, 250 yards below the dam and at the bend of the river, there is a 1.5 foot exposure of this bed, a bluish-gray, fine grained, sandy, argillaceous, soft but tough, massive marl, containing many ostracodes and Polinices duplicata, Planorbis cf. P. dissoni, Phrya raigei, a Terebra sp. and a land snail. This marl is also exposed irregularly along the top of the exposure upstream.

NOTE: The exposure in the area between sections A and B consists of bed 4 overlain irregularly by beds 2 and 3 of section A. Beds 2 and three contain many pebbles of laminated "silty" dolomite and concretions which have been oxidized and considerably leached. Bed 3 appears to be reworked, containing numerous (?) worm borings and concentrations of the hard, crystalline concretions that occur below in Bed 4. These where apparently reworked and are oxidized and leached so that "limonite" is an important constituent.

Dr. H. E. Stenzel has identified the following mollusca casts of molds from beds 2 and 3 of section A.

Voluptospina petrosa (Conrad)

Gerithium n. sp.
Turritella sp.
Globularia sp.
Glycymeris sp.
Lucinid
Trachycardium or Trigonocardia n. sp.
Chaine sp.
Tellina sp. near T. eburnlopsis Conrad

Mileage

3.1 Turn right onto woods road.
3.4 Road fork, take road to right.
3.7 STOP #9.

Periarchus bed (barnacle facies)

In a barrow pit dug for the power dam, in the center of N\(^{\frac{3}{4}}\) of SW\(^{\frac{1}{4}}\), Sec. 6, T17S, R17E is a

2.5 foot ledge of tan to cream, soft, finely granular, porous, friable, coquina-like limestone, containing many fragments of barnacles, similar to the dolomite bed 2 of section B, stop 8.

Coskinolina floridana Cole, Eodictyoconus cubensis (Cushman and Bermudez), Elphidium sp. "A", 4 ridged Nonionidae a Triloculina sp., with triangular cross section, and many other forams are found here.

NOTES: Several large boulders lie on the banks 50 feet to the south. These are silicified Ocala limestone and lie well below their original position.

This barnacle bed occurs at the base of the Periarchus bed and is a very satisfactory marker since the barnacle plates are easily recognizable in well samples even where dolomitization has occurred

Mileage

9.3 Turn right onto sand road.
10.1 Turn left onto black top road (Fla. 40).
12.7 Turn left onto U. S. Highway 19.
13.0 Withlacoochee River Bridge. Small quarry on north side of river just upstream from bridge exposes limestone with abundant shrimp claws.
Mileage

13.2 Side road on right leads to quarries which expose about 8 feet of very fossiliferous limestone of the Periarchus bed.

13.9 Cross road.

14.4 Limestone of Periarchus bed in road ditch.

15.2 Periarchus bed in road ditch.

16.2 Limestone boulders of Periarchus bed by highway.

16.3 Village of Red Level. Turn right onto black top road (old highway).

16.6 Turn right onto sand road, in front of church.

16.9 STOP #10.

Periarchus bed (dolomite)

The Golden Dolomite Company quarry at Red Level, Levy County in NW\(^2\) of SE\(^1\) of SE\(^4\), Sec. 25, T17S, R16E. Section taken on east end of south pit, July 19, 1947.

<table>
<thead>
<tr>
<th>Bed</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>to</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Red to tan, fine, argillaceous sand.

2 4.9 Tan, very soft, friable, finely crystalline ("silty"), porous dolomite which grades laterally into hard dolomite and which contains balls, rosettes, and irregular masses of hard, brown, crystalline dolomite. These masses are generally more calcic than the matrix and the bedding planes continue across some but others are uniform and show no banding.

3 4.8 Tan, rather indurated, massive, somewhat porous, finely crystalline ("silty") dolomite. Contains Periarchus lyelli (Conrad) var.?, Eupatagus sp., Corbula cf. densata, Venus sp., and Eupatagus sp. "A" (found only in the Periarchus bed), barnacle plate molds, and irregular elongated and rounded masses of crystalline material some of which resemble worm borings.
Bed  Feet
4  1.3  Tan to brown, very soft, very friable, rather dense, massive, finely crystalline ("silty") dolomite, with no fossils noted.

NOTE: Shot hole drillers report they have gone 55 feet and were still in dolomite. Some of the boulders are made up almost entirely of molds of barnacle plates. An occasional boulder indicates some oxidization by the formation of "limonite" zones. Some of these have impressions of broad plant leaves on which numerous barnacles grew. The Avon Park limestone is thought to be represented in these. The frequent occurrence of worm-like borings show a reworking of dolomite and muddy bottoms. The Gulf Dolomite Company quarry (abandoned) to the east exposes a similar section. Limestone of the Periarchus bed crops out all around these two pits although the dolomite outcrop is drawn out along a narrow strip to the south.

Mileage

17.5  Turn right onto old highway, at Red Level church.
17.8  Turn left onto sand road.
17.9  STOP #11.

Periarchus bed (limestone)

About one-quarter mile southeast of stop 10, between the old and new roads 55 in SW$	ext{c}$ of SW$	ext{c}$, Sec. 30, T17S, R17E in a road metal pit.

About 4 feet of cream to tan, soft, porous, granular massive, miliolid limestone. *Eupatagus mooreanus*

Pilaster and associated echinoids are abundant.

*Eodictyocorbus cubensis* (Cushman and Bermudez),

*Amphistegina pinarensis cosdeni* Applin and Jordan,

and *Periarchus* bed forams are present.

Mileage

18.1  Turn left (to north) on U. S. Highway 19.
18.5  Red Level. Turn right onto Fla. 483.
Mileage

18.6 Limestone boulders of Periarchus bed by road.
18.9 Limestone of Periarchus bed in pits by road.
19.2 Power line crossing. Periarchus bed by road.
19.7 STOP #12. NW 1/4, Sec. 29, T17S, R18E.

Periarchus bed (limestone)

A series of boulders and pinnacles of cream to white, soft, porous, granular, miliolid limestone, some of which are hardened and crystalline. These pinnacles and boulders contain Eodictyoconus cubensis (Cushman and Bermudez), Amphistegina pinarensis cosdeni Applin and Jordan., Peneroplid "A", Coskinolina sp., Massilina sp., Periarchus lyelli (Conrad) var., Eupatagus mooreanus Pilsbry, shrimp claws, and many other fossils.

Mileage

21.9 Drainage ditch exposing limestone of the Periarchus bed.
22.1-
22.5 Limestone pinnacles of Periarchus bed by road.
22.6 Drainage ditch exposing limestone of the Periarchus bed.
22.8 Drainage ditch exposing limestone of the Periarchus bed.
23.2 Limestone pinnacles of Periarchus bed by road.
24.2 STOP #13.

Periarchus bed and Lower Ocala limestone

In road metal pit on old road 55 in the center of the SW 1/4, Sec. 8, T18S, R17E.

Lower Ocala

Bed  Feet
1  0.5  Tan to cream, soft, massive, granular, miliolid limestone with

Periarchus bed
Bed Feet
2 up to 3.0 Cream to tan, soft, porous (hard, dense, and crystalline where weathered), granular, miliolid limestone containing many poorly preserved mollusk molds, Eupatagus mooreanus Pilsbry, Periarchus lyelli (Conrad) var., and associated echinoid fauna, Eodictyoconus cubensis (Cushman and Bermudes), Camerina sp. cf. vanderstoki (Rutten and Vermunt), Amphistegina pinarensis cosdeni Applin and Jordan, Gypsina sp., and associated forams and ostracodes.

NOTE: Throughout the quarry floor there are numerous boulders of laminated, granular, concretionary, silicified, miliolid limestone with numerous molds of Pecten sp., and large forams of the Ocala limestone.

Mileage

24.35 Quarry on left exposes lower Ocala limestone.

24.5 STOP #14

Lower Ocala limestone

The road metal pit of the Ocala Road Base Material Company in the SW_4 of NE_4, Sec. 17, T18S, R17E, lying between the old and new roads 33.

About 5.3 feet of the cream to white, soft, massive, granular, chalky, miliolid limestone of Bed 1 of stop 13 is exposed on the north side where a holothurian or sponge, cup coral, Gypsina sp., miliolids and Laganum floridanum Twitchell, L. ocalanum Cooke, Peronella cubae Weisbord, Rumphia archerensis
(Twitchell) and other echinoids were identified.

**NOTES:** If dip is considered an additional thickness is exposed on the south side of the pit, where the fossils above and *Lepidocyclina ocalana* Cushman, *Camerina* sp., were identified.

Dr. H. G. Naegeli of the Florida Geological Survey has prepared the following check list:

<table>
<thead>
<tr>
<th>Globulina</th>
<th>gibba</th>
<th>d'Orbigny</th>
<th>(C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reussella</td>
<td>ecene</td>
<td>(Cushman)</td>
<td>(C)</td>
</tr>
<tr>
<td>Spiroloculina</td>
<td>seminolensis</td>
<td>Applin &amp; Jordan</td>
<td>(C)</td>
</tr>
<tr>
<td>Amphistegina pinarensis</td>
<td>Cu. &amp; Berm. var. cosdeni A. &amp; J.</td>
<td></td>
<td>(F)</td>
</tr>
<tr>
<td>Bodiictoryconus</td>
<td>cubensis</td>
<td>Cushman &amp; Bermudez</td>
<td>(F)</td>
</tr>
<tr>
<td>Gypsina</td>
<td>globula</td>
<td>(Reuss)</td>
<td>(R)</td>
</tr>
<tr>
<td>Bolivinella sp. cf. B.</td>
<td>alata</td>
<td>Cushman &amp; Bermudez</td>
<td>(F)</td>
</tr>
<tr>
<td>Camagueya sp. cf. C.</td>
<td>perplexa</td>
<td>Cole &amp; Bermudez</td>
<td>(Sc)</td>
</tr>
<tr>
<td>Eponides sp. cf. E.</td>
<td>principiensis</td>
<td>Cushman &amp; Bermudez</td>
<td>(C)</td>
</tr>
<tr>
<td>Nonion sp. cf. N.</td>
<td>preadvenum</td>
<td>Howe</td>
<td>(C)</td>
</tr>
<tr>
<td>Nonionella sp. cf. N.</td>
<td>hantkeni (Cu. &amp; A) var. spissa Cush.</td>
<td></td>
<td>(C)</td>
</tr>
<tr>
<td>Textularia sp. cf. T.</td>
<td>adalta</td>
<td>Cushman</td>
<td>(C)</td>
</tr>
<tr>
<td>Pyrgo</td>
<td>sp.</td>
<td></td>
<td>(R)</td>
</tr>
<tr>
<td>Quinqueloculina</td>
<td>sp.</td>
<td></td>
<td>(F)</td>
</tr>
<tr>
<td>Quinqueloculina</td>
<td>sp.</td>
<td></td>
<td>(S)</td>
</tr>
<tr>
<td>Ostracoda:</td>
<td>5 species (Sc. &amp; R)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bryozoa:</td>
<td>fragments (F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Echinodea:</td>
<td>small spines (F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lower member of Ocala limestone</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mileage

24.9 Cross U. S. Highway 19, and continue straight ahead on old highway. Small quarry on left at highway crossing has lower Ocala and limestone of the Periarchus bed.

25.2 STOP #15.

Periarchus bed

Road metal pit east of old road 55 in NE\textsuperscript{1} of SE\textsuperscript{1}, Sec. 17, Tl8S, R17E.

In the pit are a series of boulders of tan to cream, hard, dense to porous, silicified limestone made up of a *Lepidocyclina - Camerina* coquina and containing *Schizaster* sp. cf. *beckeri* Cooke. These boulders are embedded in gray, blocky, sandy clay that fills solution cavities in cream colored, soft, porous, granular, miliolid limestone, weathering hard and becoming crystalline. About three feet of this limestone, the upper surface marked by pot holes, containing *Periarchus lyelli* (Conrad) var., *Pupatagus mooreanus* Pilsbry, *Fibularia vaughani* (Twitchell), *Eodictyoconus cubensis* (Cushman and Bermudez), *Amphistegina pinarensis* var., *Coskinolina (?)* sp., and an associated *Periarchus* bed fauna is exposed in the northeast side of the pit.

Mileage

25.8 Turn left onto black top road.

26.1 Junction with Fla. Highway 44, in Crystal River. Straight ahead on Fla. 44.

26.6 Side road on left.

27.8 Small sink on left exposes limestone of questionable *Periarchus* bed age.

30.1 Turn right onto road to quarry.

32.1 STOP #16.
At Crystal River Rock Company quarry located in NE\(\frac{1}{4}\) of SE\(\frac{1}{4}\), Sec. 1, T19S, R17E. Section made September 27, 1947 by Rainwater, Vernon and Walter at the center section along the north face. The lower portion was made in the northwest recess and the upper portion along the path leading up the side of the quarry about 100 yards to the south.

Oligocene—Suwannee limestone and Eocene—Ocala limestone

Suwannee limestone

Slumped section

<table>
<thead>
<tr>
<th>Bed</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>21.0</td>
</tr>
</tbody>
</table>

Tan to cream, hard, granular, massive to thin bedded limestone containing numerous *Cassidulus gouldii* (Bouve), *Periarchus* sp., abundant echinoid fragments, *Coskinolina*, *Dictyoconus* and other forams of the Oligocene of the Peninsula, and *Chione* sp., (occurs in Oligocene), *Kuphus incrassatus* Gabb, and many other mollusks. F. Stearns MacNeil reported on USGS preliminary chart 29 that *Turritella martinsi* occurs in the lower part of the Oligocene of the Peninsula in association with a Mint Springs fauna and correlated this portion with the Marianna limestone. MacNeil's bed was not recorded in the section but may be present in other parts of the quarry.

Underlying the limestone above and separated locally by greenish-gray to red, granular clay is a light gray to cream, hard, crystalline, massive limestone containing numerous mollusk molds, and an occasional *Lepidocyclina* sp. The Oligocene-Ocala contact is believed to be present in this slumped area, probably along the clay bed, but was not definitely identified.
Ocala limestone

Bed  Feet

2  14.0 Cream, granular, marly to chalky, limestone full of **Camerina-Operculinoides** species, **Turritella** sp., and **Pecten** sp. The large forams decrease toward the top and are abundant at the base only. Scattered **Lepidocyclina**, corals and mollusks are present and the lepidocyclinas increase in number toward the top.

3  18.0 Cream to white, chalky, weathering granular, massive bedded, spongy, soft limestone. Many specimens of **Amusium** sp., **Camerina** (2 spp.), **Lepidocyclina** (2 spp.), and **Operculinoides** are present.

4  0.5 Cream, hard, dense, crystalline bed of limestone grading toward the top and bottom.

5  7.0 Cream to white, chalky, soft, massive bedded limestone weathering nodular. **Ostrea podagrina** Dall, **Ostrea** sp., **Amusium ocalanum** Dall, **Lepidocyclina** (3 spp.), **Camerina** sp., and **Operculinoides** sp.

6  5.0 Cream to white limestone of lithology similar to Bed 5 with **Ocala foraminifera** and bryozoa, starfish plates, corals, **Pecten cf. "perplanus"** Dall, **Agassizia floridana** de Loriot, **Schizaster ocalanus** Cooke, **Laganum ocalanum** Cooke, **Fibularia vaughanii** (Twitchell), and others.

7  34.0 White to cream, chalky, nodular on weathered surface, massive bedded, very fossiliferous, medium hard limestone. **Amusium ocalanum** Dall, **Pecten cf. "perplanus"** Dall, **Laganum floridanum** Twitchell, and **Ocala forams** and bryozoa are present. The bed
Bed Feet

is cut by many solution features in some of which calcite has been deposited. *Cardium* sp., *Cyprea* sp., and *Ostrea podagrina* Dall are also present.

9.7 Covered to base of quarry.

**NOTES:** On the northeast side (back side) of the quarry the overburden has been stripped to expose along a large gulley large slump-blocks of both Ocala and Suwannee limestones, with dips up to 30 degrees. These end abruptly in breccia at the quarry side of the gulley. The opposite side of the gulley exposes up to 40 feet of bedded red, yellow to gray sand, sandy clays and blocky clay of possible Pleistocene age.

Dr. H. G. Naegeli has prepared the following check list of this locality.

### Lower 34 feet

<table>
<thead>
<tr>
<th>Genus</th>
<th>Species</th>
<th>Locality</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Lagena</em></td>
<td><em>laevis</em></td>
<td>(Montagu) var.</td>
<td>(C)</td>
</tr>
<tr>
<td><em>Reussella</em></td>
<td><em>eocena</em></td>
<td>(Cushman)</td>
<td>(S)</td>
</tr>
<tr>
<td><em>Camerina</em></td>
<td><em>vanderstoki</em></td>
<td>(Rutten &amp; Vermunt)</td>
<td>(F)</td>
</tr>
<tr>
<td><em>Cibicides</em></td>
<td><em>mississippiensis</em> (Cu) var. <em>ocalanus</em></td>
<td>Cushman</td>
<td>(Sc)</td>
</tr>
<tr>
<td><em>Gypsina</em></td>
<td><em>globula</em></td>
<td>(Reuss)</td>
<td>(R)</td>
</tr>
<tr>
<td><em>Eponides</em></td>
<td>sp. cf. E.</td>
<td><em>budensis</em> Hantken var. <em>planata</em></td>
<td>Cushman</td>
</tr>
<tr>
<td><em>Montion</em></td>
<td>sp. cf. N</td>
<td><em>preadvenum</em> Howe</td>
<td>(Sc)</td>
</tr>
<tr>
<td><em>Siphonina</em></td>
<td>sp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Textularia</em></td>
<td>sp. (juvenile)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Ostracoda</em> :</td>
<td>1 species</td>
<td>(R)</td>
<td></td>
</tr>
<tr>
<td><em>Bryozoa</em> :</td>
<td>fragment</td>
<td>(R)</td>
<td></td>
</tr>
</tbody>
</table>

### 34-39 feet above base

<table>
<thead>
<tr>
<th>Genus</th>
<th>Species</th>
<th>Locality</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Reussella</em></td>
<td><em>eocena</em></td>
<td>(Cushman)</td>
<td>(S)</td>
</tr>
<tr>
<td><em>Cibicides</em></td>
<td><em>mississippiensis</em> (Cu) var. <em>ocalanus</em></td>
<td>Cushman</td>
<td>(F)</td>
</tr>
<tr>
<td><em>Gypsina</em></td>
<td><em>globula</em></td>
<td>(Reuss)</td>
<td>(Sc)</td>
</tr>
<tr>
<td><em>Discorbis</em></td>
<td><em>bulla</em></td>
<td>Cushman</td>
<td>(R)</td>
</tr>
</tbody>
</table>
Triloculina sp. cf. T. tricarinata d'Orbigny (R)
Quinqueloculina sp. (badly preserved) (F)
Siphonflex sp. (Sc)
Textularia sp. (juvenile) (F)
Ostracoda: 2 species (R)
Bryozoa: 2 species (R)
Pelecypoda: fragment of small Pecten (R)

39-46 feet above base

Gypsina globula (Reuss) (S)
Lepidocyclina ocalana Cushman (S)
Reussella eocena (Cushman) (S)
Cibicidoides mississippiensis (Cu) var. ocalanus Cushman (F)
Heterostarina ocalana Cushman (Sc)
Discocyclina sp. cf. D. flintensis (Cushman) (R)
Gyroidina sp. cf. G. nassauensis Cole (R)
Nonion sp. cf. N. p readv enum Howe (R)
Textularia sp. (juvenile) (Sc)
Ostracoda: 1 species (R)
Bryozoa: 2 species (Sc)
Echinoidea: 2 species, fragments, plate, spine (R)
Gastropoda: 2 species small casts (Sc)
Pelecypoda: 2 species small cast and fragment of Pecten (R)

46\frac{1}{2}-64\frac{1}{2} feet above base

Camerina vanderstokii (Rutten & Vermunt) (C)
Gypsina globula (Reuss) (C)
Lepidocyclina ocalana Cushman (C)
Reussella eocena (Cushman) (S)
Valvulina
Lagena
Valvulina sp. cf. V.
Textularia
Bryozoa :
Pelecypoda:
ocalana
laevis
intermedia
sp. (juvenile)
1 species (R)
small cast, fragment of small Pecten (R)

64 1/4-70 1/4 feet above base
Camerina
Cypsinella
Eponides
Lepidocyclina
Textularia
Bryozoa :
Pelecypoda:
vanderstoki (Rutten & Vermunt) (Ab)
globula (Reuss) (C)
jacksonensis (Cushman & Applin) (F)
ocalana Cushman (F)
sp. (juvenile)
2 species (fragments) (Sc)
fragment of Pecten (R)

70 1/4-84 1/4 feet above base
Eponides
Operculinoides
Cypsinella
Lepidocyclina
Gaudryina sp. cf. G.
Textularia sp. cf. T.
Bryozoa :
Pelecypoda:
jacksonensis (Cushman & Applin) (S)
ocalana Cushman (S)
globula (Reuss) (F)
ocalana Cushman (F)
jacksonensis (Sc)
adalta (Sc)
3 species (R)
fragment of small Pecten (R)

Mileage
34.0 Turn right onto Fla. 44, to Inverness.
36.4 Side road on left.
36.6 Side road on left.
Mileage

37.5 Junction with Fla. 490.

38.1 Village of Lecanto. Cross Fla. 491. Ocala limestone in sinks beside road.

39.3 Side road on left leads to Rock Sink, about 3 miles distant, which exposes about 40 feet of Ocala limestone.

45.5 West city limits of Inverness.

47.9 Turn left onto U. S. Highway 41, in Inverness.

48.1 S & W Cafe on right.

52.9 Village of Hernando. Old phosphate pit on left, with pinnacles of Ocala limestone in bottom.

53.3 Keep to left on U. S. Highway 41.

54.1 Phosphate plant on right.

54.3 Phosphate pit on right.

55.4 Turn right onto sand road, at Felicia Railroad Station, on left.

55.8 STOP #17. Abandoned phosphate mine.

*Periarchus* bed or older

In center of NW1/4, Sec. 10, T18S, R19E. This is the last pit operated by the Dalloton Phosphate Mining Company. The frontispiece of Florida Geological Survey Bulletin 24 is an aerial view of the operations.

In large boulders turned out of the pit during mining operations are specimen of *Eupatagus mooreanus* Pilsbry, *Periarchus lyelli* (Conrad) var. A large clam found elsewhere in association with *Periarchus* fauna, *Manatee* ribs, Turtle plates, and mollusk molds.

NOTE: Most phosphate pits in the area expose similar boulders. The sands and clays of possible Pleistocene age that overlie this limestone are similar in thickness and lithology to that described at stop 18.
Mileage

56.2 Turn right onto U. S. Highway 41.

56.3 Railroad crossing. Building on left was started as a power unit during the Florida land boom.

58.0 Phosphate prospect pit on left.

59.1 Village of Holder.

62.9 Turn right onto sand road to Section 12 mine.

63.1 Railroad crossing.

63.3 Road fork; take left fork.

63.5 Soft rock, phosphate mine on right.

63.8 STOP #13.

Phosphate deposits of Pleistocene or Pliocene age, and *Porichthus* bed or older.

At the C. and J. Camp, Inc., and J. Buttgenbach and Company, Section 12 mine located in SW_1/4 of NE_1/4, Sec. 12, T17S, R18E. Section made July 16, 1946.

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<table>
<thead>
<tr>
<th>Top Bed</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleistocene?</td>
<td></td>
</tr>
<tr>
<td>1 + 30.0</td>
<td>Tan to red and purple, unconsolidated, poorly sorted, bedded, fine to coarse, quartz sand with soil zone at top. Sand is coarser toward base.</td>
</tr>
<tr>
<td>to 40.0</td>
<td></td>
</tr>
<tr>
<td>2 0</td>
<td>White to gray, argillaceous, unconsolidated, fine to medium, quartz sand with consolidated lenses and irregular beds grading laterally and up into Bed 1.</td>
</tr>
<tr>
<td>to 10.0</td>
<td></td>
</tr>
<tr>
<td>3 3.0</td>
<td>Tan to brown, phosphatic (?), sandy, blocky, fuller's earth like clay. Greatly slumped. Removed by dragline as overburden. Grades laterally into yellow, argillaceous, poorly consolidated and slumped sand dunes.</td>
</tr>
<tr>
<td>to 24.0</td>
<td></td>
</tr>
</tbody>
</table>
Bed   Feet

4     3.0 to 18.0 Light gray, friable, argillaceous, very fine to fine quartz sand. Grades into Bed 3.

5     4.0 Variable thickness, same as bed 6 but decrease in phosphate present and increase in sand. Considerably slumped in north end of pit.

6     11.0 to 27.0 ORE BED. Mottled red, gray and pastel colors of sandy, phosphatic clay containing irregular lenses of white, argillaceous sand, gray to tan, blocky clay, large irregular, purple, tan and brown masses of phosphate, phosphatic limestone, chert, silicified limestone, sand clusters, and clay balls. The phosphate is concentrated toward the base and this bed extends into solution cavities of the underlying limestone and phosphate solutions have replaced portions of the bed rock.

7 up to 0.3 Black to brown, fibrous peat present irregularly and grading into beds 7 and 8.

8 up to 0.3 Black "sapropel" or reworked organic matter containing no fossils.

9 to 1.6 Red, waxy, dense, blocky, fuller's earth-like clay.

Periarchus bed(?)

10 up to 17.0 Gray to tan, hard, dense, massive, miliolid limestone containing fragments and molds of echinoids and mollusks, and Peneroplid sp. "A". The top is cut by many pot holes, caverns, and portions of the limestone are silicified or replaced by laminar phosphate. The bed is largely below water level.

Note: The complete section, 96.6 feet, was taken on the north
side of the pit, which is located on the escarpment of
the Withlacoochee River Valley. While the lithologies
above are identifiable the whole section varies as if
mixed and slumped in a giant sink. In the quarry an 81
foot face is maintained above water level (July 16, 1947)
and the pit foreman reports the only way to reduce the
water level was to pump a 300 foot well located one-quarter
mile from the pit at the plant and create a large drawdown
and cone of depression, at which time the water in the pit
lowers. Since the limestone exposed at the pit is Eocene
the water level in the pit probably represents the Piezo-
metric surface.

Mileage

64.3 Turn right onto U. S. Highway 41.
67.4 Junction with Fla. 438.
67.6 Withlacoochee River bridge, Dunnellon. Follow U. S. Highway 41
through Dunnellon.
69.3 Phosphate pits on left.
69.6 Railroad overpass.
69.8 Phosphate pit on right.
71.7 Turn right onto road to Rainbow Springs.
72.4 Cross railroad; Rainbow Falls Railroad station on left.
72.7 STOP #12

Rainbow Springs at Rainbow Falls, Marion County

Talk by Mr. H. H. Cooper, Jr., District Engineer, U. S. G. S.
Ground water Division, on the hydrology of Florida Springs.

The following description is copied from Florida Geological

"---These springs, rising among the wooded, rolling highlands
in the southwest corner of Marion County, form the headwaters of
Rainbow River which winds its way south for 5 miles to the point it
joins the Withlacoochee River. The headpool is semicircular in shape
with a diameter of about 400 feet. The principal improvements surround
this pool, while 1 mile to the east other springs form a second pool
whose outflowing waterway joining Rainbow River gives the headwaters
area of the river the shape of a huge, rounded Y.

"There are four relatively deep spring cavities in the headpool,
and four cavities of lesser depth in the pool to the east. Maximum depths in these headpool cavities on February 18, 1947 were 11.6 and 14.2 feet, these being in the first and second narrow reaches of the pool respectively. The cavities in the east pool and the run near their southeast shores were sounded on the same date and found to have depths of 4.5 and 7.0 feet, respectively. A spring one mile downstream from the headpool, which boils from a crevice in the lime-rock, known as Garfish Hole, was found to have a maximum depth of 24 feet on January 8, 1947. Numerous small springs and "sand boils" may be noticed in both pools and the river. The aquatic vegetation is very luxuriant at these springs.

"The water surface elevation of the headpool varies seasonally with the amount of rainfall in the area. The maximum stage that has been observed during the period October 8, 1930 to February 18, 1947 is 33.09 feet above mean sea level on July 5, 1934. The minimum stage that has been observed during the same period is 30.07 feet above mean sea level on February 8, 1941. An average annual range based on monthly observations in this same period is from 31.2 feet to 31.8 feet above mean sea level."

"---The flow of Rainbow Springs has been measured at about monthly intervals since February 9, 1931, and the graphical plotting of these measurements in relation to time and discharge is given in figure 7. It will be noticed that the trends of discharge of Rainbow Springs follow those of Silver Springs Run fairly well. A tabulation of monthly and annual mean discharge values is presented in Table 3. The annual mean flow for the period 1932-46 is 699 second-feet (452 m.g.d)."

Mileage

73.7 Turn right onto U. S. Highway 41.
74.5 Fla. 40 to right; straight ahead on U. S. Highway 41.
76.4 Sink in field on left.
81.8 Levy-Marion county line.
83.7 Boulders of Ocala limestone on left.
84.0 Ocala limestone in left road bank.
84.6-
84.8 Phosphate matrix rock in road bank.
85.2 Low plain on right is developed on Ocala limestone. Silicified Ocala limestone boulders scattered on surface.
86.2 Village of Morriston on right.
Mileage

89.6 Village of Montbrook on right.
90.2 Ocala limestone in right road ditch.
90.4 Ocala limestone in left road ditch.
90.9 Ocala limestone in pit on left.
91.8 Ocala limestone in pit on left.
92.0 Ocala limestone in left road ditch.
92.6 Ocala limestone in quarry on left.
93.0 Cross road; Army airbase on left.
94.3 Williston railroad station. Follow U. S. Highway 41 through business section.
94.8 Turn right onto sand road.
94.9 Turn left onto black top road.
95.0 Turn right onto sand road to quarry.
95.1 STOP #20.

Ocala limestone (typical)

Quarry in the NW 1/4 of SE 1/4, Sec. 31, T12S, R19E, operated by Cornell and Shultz in the NE section of Williston, Florida.

45 feet of cream to white, soft, friable, porous, granular, coquina of Lepidocyclina, Camerina, Operculina, Pecten, Amusium, and scattered fossils in a chalky matrix.

NOTE: This is the highest quarry face in the county. In mining the limestone, the clay filled pot holes are cleaned by hand and several, recently cleaned, can be seen on the quarry rim. Two bulldozers, one plowing and one scraping are used to dig the limestone. It is then loaded by shovel to trucks which dump into two cable cars. The limestone is crushed by rollers and loaded. It takes about seven minutes to load a car of rock and about 50 cars can be loaded in a day. During low water the base of the pit is mined and stock piled. The rock sells for one dollar per ton.
TERTIARY FORMATIONS CROPPING OUT IN CITRUS AND LEVY COUNTIES

by Robert O. Vernon,
Associate State Geologist
Florida Geological Survey

INTRODUCTION

It is planned in this discussion to present the general features of the beds to be seen on the fifth field trip sponsored by the Southeastern Geological Society. Most of the notes contained in this discussion are taken from the manuscript of a paper covering the geology of these two counties to be published as a Florida State Geological Survey bulletin.

It is hoped that the inspection and study of these beds during this field trip will encourage discussion of the stratigraphy to the end that definite correlation points can be established that will meet the approval of most if not all stratigraphers.

STRATIGRAPHY

The oldest rock exposed in the area is the upper bed of the late middle Eocene, the Avon Park limestone. This bed and sediments of the lower Jackson group, designated herein as the Periarchus bed, crop out in the southwestern part of Levy County and the northeastern and northern parts of Citrus County. Younger beds crop out in irregularly concentric patterns to the north, east, and south of these areas.

A system of faults trending generally northwest-southeast and northeast-southwest is known to be present in the area.

The relationships of the beds cropping out within the field trip area can be best presented and illustrated by the following graphical chart.
<table>
<thead>
<tr>
<th>Age</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eocene</td>
<td>Upper member (Lower Ocala limestone)</td>
<td>Stop 13, 14                                                                                                                                      Cream to white, soft, porous, granular to chalky, very uniform and pure, miliolid limestone. Large forams sparse.</td>
</tr>
<tr>
<td></td>
<td>Lower member (Periarchus bed)</td>
<td>Stopped 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14(?) 15, 17, 18                                                                                      Cream to tan (weathers pink, brown and gray), granular to crystalline, medium hard, massive limestone and tan to brown finely crystalline, very porous, massive dolomite. Echinoids compose a large part of the faunal content.</td>
</tr>
<tr>
<td></td>
<td>Unconformity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avon Park limestone</td>
<td>Stopped 2, 3(?) 4, 6, 8, 17(?) 18(?)                                                                                                           Tan, light gray, chalky, thin-bedded to platy and laminated, carbonaceous limestone with very fossiliferous lenses interbedded with non-fossiliferous beds. Tan to brown, finely crystalline (&quot;silty&quot;) porous, platy and laminated to massive dolomite.</td>
</tr>
<tr>
<td></td>
<td>Ocala limestone (Restricted this paper)</td>
<td>Stop 16, 20                                                                                         Cream to white, very soft, granular to chalky, highly calcareous, massive, large foraminiferal coquina limestone</td>
</tr>
<tr>
<td></td>
<td>Unconformity (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Turritella martinensis Zone (1)</td>
<td>Stop 16                                                                                                                                       Cream to white, thin-bedded, soft and porous, somewhat dense, granular limestone weathering hard on exposure</td>
</tr>
<tr>
<td>Miocene</td>
<td>Suwannee limestone</td>
<td>See stop 16                                                                                                                                    Cream to white, soft, porous, granular, thin-bedded limestone, usually indurated on outcrop</td>
</tr>
<tr>
<td></td>
<td>Unconformity</td>
<td></td>
</tr>
<tr>
<td>Cretaceous</td>
<td>Jackson group</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upper member</td>
<td>Stop 13, 14                                                                                                                                      Cream to white, soft, porous, granular to chalky, very uniform and pure, miliolid limestone. Large forams sparse.</td>
</tr>
<tr>
<td></td>
<td>Lower member (Periarchus bed)</td>
<td>Stopped 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14(?) 15, 17, 18                                                                                      Cream to tan (weathers pink, brown and gray), granular to crystalline, medium hard, massive limestone and tan to brown finely crystalline, very porous, massive dolomite. Echinoids compose a large part of the faunal content.</td>
</tr>
<tr>
<td></td>
<td>Unconformity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avon Park limestone</td>
<td>Stopped 2, 3(?) 4, 6, 8, 17(?) 18(?)                                                                                                           Tan, light gray, chalky, thin-bedded to platy and laminated, carbonaceous limestone with very fossiliferous lenses interbedded with non-fossiliferous beds. Tan to brown, finely crystalline (&quot;silty&quot;) porous, platy and laminated to massive dolomite.</td>
</tr>
</tbody>
</table>

(1) F. Stearns MacNeil, U. S. Geol. Survey, Oil and Gas Investigation Preliminary Chart No. 29 and (2) Mansfield (24, 1939).
EOCENE

Claiborne group

General

The Claiborne group in Florida has been described and correlated by Applin and Applin (2, 1944) who erected three formations in this group, namely, the Avon Park limestone, the Tallahassee limestone and equivalent non-fossiliferous limestone, and the Lake City limestone, with respective ages as follows: upper late middle, lower late middle, and early middle Eocene. Since only the Avon Park limestone crops out in the field trip area this discussion begins with the Avon Park limestone, and older beds are considered in the section of the guidebook written by Joseph E. Banks.

Discussion of the terms Avon Park limestone and Gulf Hammock formation

In their paper published in 1944, Applin and Applin (2) described a bed of "mainly cream-colored, highly microfossiliferous, chalky limestone," which they named the Avon Park limestone. Samples from the Florida Geological Survey W-668, a well at the U. S. Army Avon Park Bombing Range in Polk County, was selected as the type. Subsequently David B. Ericson (19, 1945), formerly of the Florida Geological Survey, described beds of dolomite, dolomitic limestone and limestone cropping out in the Gulf Hammock area in Levy and Citrus counties and named them the Gulf Hammock formation. On the basis of foraminifers (largely molds) he correlated these beds with the Avon Park limestone and suggested the abandonment of the term Avon Park limestone in favor of the name proposed for the outcrop area. In 1946 the Florida Geological Survey initiated the study of the geology of Citrus and Levy counties, during the progress
of which a definite unconformity was discovered at the base of the Periarchus bed. From the data accumulated during this work it is suspected that the Periarchus bed is equivalent to the Peronella dalli bed of Polk County and has overlapped an extensive area throughout the central peninsular Florida. The Levy-Citrus area has been faulted and the nature of this overlap and the size and extent of faulting will be determined with future field work and prospecting.

The Gulf Hammock formation as originally defined thus includes an unconformity that appears to be of regional significance.

In order to simplify discussion the chart on page 39 is presented to give the comparison of the geologic section of the type area of the Avon Park limestone with that of Citrus and Levy counties and, in order to encourage discussion, the section in Alabama, generalized and prepared with the help of F. Stearns MacNeil, is also given, although no attempt at precise correlation with the Alabama section is intended.

If reference is made to this chart, it can be seen that the writer has tentatively correlated the Periarchus bed with the Peronella dalli bed, the upper part of the Avon Park limestone, thus restricting that formation. The Jackson-Claiborne contact is placed at the base of the Periarchus lyelli bed where an unconformity is known to be present in the outcrop area. No time break is known in the type Avon Park area and the correlation with the Peronella dalli bed is based on lithological and faunal similarities.

It is proposed to erect a new formation in the Jackson group to include two members, namely, the lower Ocala limestone and the Periarchus bed with appropriate place names to be applied to each at a later date.
Avon Park limestone
(Restricted)

Upper late middle Eocene

(Stops 2, 3(?), 4, 6, 8, 17(?), and 18(?))

As restricted the Avon Park limestone of the outcrop area is composed of many lithologies having in common a high carbonaceous content and a distinct and prolific fauna. Three general lithologies have been recognized as follows:

(1) Cream to brown, granular elements in a chalky matrix, very fossiliferous, massive, porous, calcareous, miliolid limestone that has a purple-brown tint upon weathering. This bed contains abundant species of Mollusca and Foraminifera. It grades through lithographic limestone, a thin "fucoid" (?) bed, peat, and carbonaceous limestone-dolomite clay into the other general types.

(2) Cream to brown, thin-bedded, chalky, carbonaceous, very fossiliferous limestone, not exposed and

(3) Tan to brown, thin-bedded and laminated, very carbonaceous, soft, porous and friable, very finely crystalline ("silty") dolomite.

In some wells the entire section of the Avon Park is dolomitized and the fauna exists as molds if it is not entirely absent. The top of the formation is marked by a definite unconformity, a faunal change, and usually by a lithologic change, but in the largely limestone section of the Peninsula the contact with the underlying beds has no significant break in lithology and the base is selected largely through faunal changes. In some wells an abundance of gypsum and the occurrence of beekite mark the top of the Lake
City limestone

In the Levy and Citrus area the Avon Park limestone (restricted) ranges from 300 feet to 56 feet in thickness. This determination of the thickness of the formation will undoubtedly be changed with the receipt of more information from additional wells.

The fauna of the Avon Park limestone has been presented in papers listed in the bibliography, Applin and Applin (2, 1944), Applin and Jordan (1, 1945), Cole (5, 1942; 6, 1944), Cooke (15, 1945), Ericson (19, 1945) and in fossil lists as presented in the geologic sections.

In addition to these papers Dr. H. V. Howe, Dean of Arts and Sciences, Louisiana State University, has prepared a paper on the ostracodes from the Avon Park limestone of bed 6, stop 6. He has described and figured twenty-nine species, all of which are new, and has erected seven new genera. His paper will be published with the report on the geology of the area, in the near future.

The foraminifers are very abundant, although largely undescribed. The writer is preparing a paper on the Foraminifera of the Avon Park limestone and a companion paper on the Foraminifera of the Periarchus bed, which will supplement the fauna as given in the papers listed above. These studies will be published by the Florida Geological Survey.

"Gulf Hammock formation"

Stop 3

The beds which are designated "Gulf Hammock formation" in the chart on page 39 were described and named by David B. Ericson (19, 1945) and included the Periarchus bed of Jackson group age and only a part of the Avon Park limestone of Applin and Applin (2, 1944) which is placed in the
Claiborne group. Since the Avon Park limestone is very thin in parts of the outcrop area and since a regional unconformity separates it from the Periarchus bed in this area, Ericson's correlation was inexact and the term Gulf Hammock formation, if continued, must be redefined.

**Jackson-Claiborne Contact**

The problem of the location of the Jackson-Claiborne boundary is similar to the problem in other States. This is evident if reference is made to the chart on page 39, showing comparisons of Florida sections with a generalized section of Alabama.

In placing the boundary of the Jackson group and the Claiborne group in Florida there appears to be only one choice, at least insofar as the outcrop area is concerned. However, in selecting this boundary there must be not only a convenient mapping differentiation but all possible segregations must be considered, on the basis of factual data and logic.

Convenient lithologic breaks at the top of the Periarchus bed and at the top of the Avon Park limestone in the outcrop area suggest possible boundaries. Where the section is dolomitized separation at these horizons is made possible, generally through the occurrence of a barnacle bed (step 9) (easily identifiable even where dolomitized) in the base of the Periarchus bed and through the preservation of the echinoids and mollusks as molds throughout the Periarchus bed. The Avon Park limestone contains considerable carbonaceous material and the Periarchus bed and younger sediment almost none.

The Jackson-Claiborne contact can be placed at the top of the Avon Park limestone, which appears to be the most logical place. The division here places three limestones of similar characteristics, the basal Periarchus bed, the Lower Ocala limestone (upper and lower members of a new formation), and the Ocala limestone, into the Jackson group, restricts all highly carbonaceous
beds to the Claiborne group, and separates the Jackson group from older beds by an unconformity. Faunas of Jackson group affinities begin in the Periarchus bed and range upward. All known described Eocene echinoids in Florida thus are confined to the Jackson group and many are confined to, or begin in, the Periarchus bed and range upward. This widespread, shallow-water facies is overlain by limestones of deeper-water facies indicating encroachment of seas following the initiation of Periarchus bed time. The widespread occurrence of Periarchus lyelli Conrad, even though a possible variety of the species in Florida, provides a basis by which comparisons with Jackson-Claiborne sections elsewhere can be made. The species is recognized as a basal Jackson form.

Since the Periarchus bed has a distinct and bizarre fauna with combined Gosport and Jackson affinities and since there generally is a lithologic break at the top, some argument could be presented that the top of the Periarchus bed should be the Jackson-Claiborne contact. In favor of placing the contact here it can be cited that some species found in the Avon Park limestone continue through the Periarchus bed, but against it the Periarchus marks the beginning of Jackson fauna. Placing the contact at this horizon has the obvious disadvantage of including within the Claiborne a marked unconformity, in a section where unconformities are rarely recognized. It likewise has the less obvious disadvantage of including dissimilar facies, an alternate deep marine and shallow lagoonal facies overlain by a shallow-water beach facies, with the lower facies having been eroded.

Each of the proposed segregations has its disadvantages and advantages. Regardless of the horizon at which the contact is placed, a division on essentially a lithologic grouping is difficult since the entire section is calcareous and since dolomitization moves up and down the section. Considering
lithologic differences, faunas, and non-deposition or erosion in the section
the boundary of the Jackson-Claiborne beds can be placed at the top of the
Avon Park limestone, as restricted.

The Avon Park limestone is overlain by the Periarchus bed at the dam of
Florida Power Corporation on the Withlacoochee River, stop 8. Here, both beds
are dolomitized although the Avon Park limestone is laminated, carbonaceous,
and thin-bedded and the Periarchus bed is massive. Molds of mollusks are
common in the upper bed and the writer has made collections of casts which
have been studied by H. B. Stenzel—see stop 8.

This is the best available exposure of the two beds and it has been
studied with particular care. The contact is rather definite, and is exposed
along a long section. In some places the laminated dolomite lies higher in
the section than at others. It contains many crystalline "cannon" ball
dolomite concretions. The base of the overlying Periarchus bed contains
pebbles of the laminated dolomite and a concentration of the dolomite
concretions, many of which are leached and oxidized. This bed gives the
appearance of a greatly reworked sediment and contains numerous animal(?)
borings.

The outcrop clearly represents an eroded Avon Park limestone overlain
by the Periarchus bed, the base of which is a soil mantle representing
residue from the lower bed.

EOCENE

  Jackson group

Early upper Eocene

Prior to publication of the bulletin on the geology of the area a
new formational name will be proposed or the term "Gulf Hammock formation"
will be redefined to include two members that represent the base of the
Jackson group in Florida. This formation will be composed of a lower and an upper member designated here as the Periarchus bed at the base and the Lower Ocala limestone at the top. Appropriate place names will be selected for these members when the manuscript is completed.

"New formation"

**Lower member (Periarchus bed)**

In well logs of the Florida Geological Survey as early as 1941, beds older than the Ocala limestone were recognized by both Sidney A. Stubbbs and the writer. These were referred to the "Coskinolina zone" of the Eocene. Later, Ericson (19, 1945) placed all of these beds in his "Gulf Hammock formation." The upper portion of these beds are now known to be Jackson in age, and because of the prominence of Periarchus lyelli var. this portion has been called the Periarchus bed. Portions of this bed were undoubtedly included in their lower member of the Ocala limestone by Applin and Applin (2, 1944) and by Applin and Jordan (1, 1945).

The Periarchus bed is a cream to tan, granular and rarely chalky, porous, fairly hard, massive limestone containing an abundant and bizarre fauna, mollusks and echinoids being very prominent. In the outcrop area the base of the bed has been dolomitized and rarely the complete section is dolomite. Where dolomitized the bed is tan to brown, very porous but poorly permeable, finely crystalline ("silty"), soft and friable ranging to hard and indurated, massive dolomite. The base is generally marked by a well developed barnacle bed, stop 9, and the echinoids appear to be more concentrated toward the base of the bed.

The bed is thin but very resistant and underlies most of the swamp
known as Gulf Hammock at low and consistent elevations. This is apparent when it is realized that the road from the town of Otter Creek to Crystal River, a distance of 35 miles, is underlain by the limestone and dolomite of the *Periarchus* bed except for narrow areas where the Avon Park limestone is present.

The bed is known from core tests to be as much as 55 feet in thickness and locally may be thicker. It is separated from the underlying Avon Park limestone by an unconformity and its boundaries are marked by distinct faunal changes and usually by lithological breaks, stop 14.

The fauna is prolific but largely undescribed. Dr. H. B. Stenzel has prepared some preliminary check lists for the stops of the field trip and is continuing this study. Some foraminifers and other fauna have been described from this bed in the following papers listed in the bibliography, numbers 1, 2, 5, 6, 13, 14, 15 and 30. Additional studies are being made by the writer.

Mr. Alfred Fischer, under the Florida Geological Survey sponsorship, is preparing a paper on the echinoids of the area and has tabulated on page 47 a chart, partially after Cooke (14, 1942), to show the relationship of the species within the Eocene.

*Peronella dalli* is questionably placed into the Avon Park limestone until the species can be traced into the outcrop area by means of wells and comparisons of several types can be made. It will be noted that with the possible exception of this species all known Eocene echinoids have their origin in the Jackson group as defined in this paper, and six species are confined to the *Periarchus* bed. Eight additional species originate in the *Periarchus* bed and range upward.
<table>
<thead>
<tr>
<th></th>
<th>Avon Park ls.</th>
<th>Periarchus bed</th>
<th>Ocala ls. (Restricted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibularia vaughani</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oligopygus wetherbyi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oligopygus haldemani</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amblypygus americanus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Periarchus lyelli</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laganum floridanum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laganum ocalanum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peronella crustuloides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peronella cubae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peronella dalli</td>
<td></td>
<td></td>
<td>?? -</td>
</tr>
<tr>
<td>Rumphia archerensis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rumphia eldridgei</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cassidulus (C) n. sp. &quot;a&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cassidulus (C) trojanus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cassidulus (Paralampas) n. sp. &quot;b&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cassidulus (Paralampas) lyelli,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cassidulus (Paralampas) conradi,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cassidulus (Paralampas) carolinensis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schizaster armiger</td>
<td></td>
<td></td>
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<td>Schizaster beckeri</td>
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<td>Schizaster (Linthia) ocalanu,</td>
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<td>Agassizia floridana</td>
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<td>Brissopsis steinhatchee</td>
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<td>Eupatagus mooreanus</td>
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<td>Eupatagus n. sp. (Cooke)</td>
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<td>Eupatagus ocalanus</td>
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<td>Eupatagus dixie</td>
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"New formation"

Upper member ("Lower Ocala limestone")

Applin and Applin (2, 1944) recorded for the first time a division of the Ocala limestone and gave the general lithological and faunal characteristics of two members, an upper and a lower, both of which are limestone. In order to provide a nomenclature for discussion the writer is using "Lower Ocala limestone" for the upper member of a proposed new formation although as used here the term differs from Applin and Applin's usage in that the Periarchus bed was included in their lower member of the Ocala limestone, but has been separated in this paper. An appropriate place name will be assigned to this member at a later date. As segregated in this discussion the bed is known to be about 30 feet in thickness in the outcrop area, but additional information to be made available in the future may show this bed to be thicker.

The Lower Ocala limestone is a cream to white, chalky, porous, very calcareous, massive limestone that is characteristically less resistant than the Periarchus bed but is generally harder than the Ocala limestone (restricted), which overlies it. Chert and silicified limestone retaining the character of the original rock are common, generally near the base of the member at outcrop areas.

In contrast to the typical Ocala limestone, the Lower Ocala limestone contains few large foraminifers. The writer has identified Camerina sp. cf. C. vanderstoki (Rutten and Vermuth) Camerina moodysbranchensis Gravell and Hanna, C. sp. cf. C. jacksonensis Gravell and Hanna and rare specimens of Lepidocyclina sp. cf. L ocalana and almost no others. These species appear to be confined to the upper member except for C. sp. cf. C. vanderstoki which ranges throughout the Jackson group including the upper part of the Periarchus bed.
The bed contains in common with the Periarchus bed numerous species of miliolid foraminifers largely undescribed and two species of Gyspina, numerous specimens of Amphistegina pinarensis var. and an occasional specimen of Eodictyoconus cubensis. The abundance of miliolids and the sparsity of large foraminifers and mollusks characterize the upper member of this proposed new Jackson formation. Echinoids originating in the Periarchus bed (see chart on page 47) and ranging upward, occur in this bed. The papers designated in the bibliography under numbers 1, 2, 13, 14, and 16 describe some of the faunas.

The Lower Ocala limestone is separated in the outcrop area from the underlying Periarchus bed by changes in lithology, by the abrupt termination of typical Periarchus bed molluscan and foraminiferal faunas and by an increase in the percentage of miliolid foraminifers. The upper limit of the bed is less definitely defined and the somewhat abrupt decrease in the numbers of large foraminifers and a change of species mark the top and locate the upper boundary. This boundary is sometimes marked by an increase in hardness of the limestone and by interstices of the Lower Ocala being filled with secondary calcite. This member is believed to be gradational with the Ocala limestone (restricted) and the top is a very irregular one with the various species of large foraminifers, used as guide fossils for the division of the Jackson group, occurring higher in geologic sections in some areas than in others, this is apparently a facies segregation.

Jackson group
Late upper Eocene
Ocala limestone (restricted)

If a complete bibliography on the Jackson group were compiled it would undoubtedly include several hundred papers dealing with rocks of this age.
An historical summary of the use of the terms "Jackson group" and "Ocala limestone" in Florida is given in Florida Geological Survey bulletin 21, and it will not be repeated here.

C. Wythe Cooke (7, 1915) of the U. S. Geological Survey established the Jackson age of the Ocala limestone and his conclusions have been accepted without question by subsequent writers. In "The Geology of Florida" Cooke (15, 1945) included in his Ocala limestone two beds, namely, the Periarchus bed and the "Lower Ocala limestone," which are separated in this paper to form a lower formation of the Jackson group. These two beds correspond to Applin and Applin's (2, 1944) "lower member of the Ocala limestone", as indicated in previous discussions.

The writer is restricting his use of the "Ocala limestone" to the chalky, massive, coquina limestone, largely composed of specimens of large foraminifers, as typified by outcrops at the type locality, Ocala, Florida. The Ocala limestone (restricted) overlies and grades downward into beds of the lower Jackson group, as used in this paper.

This formation is known from many hundreds of well samples as well as from a broad outcrop area. It is a white to cream, soft, very massive although fossil concentrations provide some bedding, sometimes very friable, chalky coquina, the large percentage of shells being remains of large Foraminifera.

The limestone is exposed beneath the Pleistocene deposits throughout the eastern, northern and western portions of Levy County and is absent from central, southeastern and southern portions. All of Citrus County, with the exception of a band along the Withlacoochee River that widens at the coast to extend to the vicinity of Crystal River, is underlain by this formation.

The fauna of the Ocala limestone from the type locality has been adequately worked, and most of the Mollusca, Echinoidea and Foraminifera have
been thoroughly described. Perhaps some additional work will be necessary to segregate those fossils described from the outcrop areas in Citrus and Levy counties, since some of these outcrops are known to be lower Jackson in age. In the field it was found that few species were common to the Ocala limestone (restricted) and to the lower Jackson group as used in this report. *Lepidocyclina ocalana* Cushman, two species of *Heterostegina*, species of *Asterocyclina*, *Operculinoides ocalanus* (Cushman) and *Operculinoides willcoxii* (Heilprin) are characteristic of the Ocala limestone (restricted). *Camerina* sp. cf. *C. vanderstoki*, some species of miliolids, two species of *Gypsina*, *Lepidocyclina* sp. cf. *L. ocalana* are common to both the upper and lower Jackson, whereas, *Camerina moodysbranchensis* Gravell and Hanna, *C*. sp. cf. *C. jacksonensis* Gravell and Hanna, and *Lepidocyclina* sp. of the larger forams appear to be confined to the upper member of the lower Jackson.

Numbers 1, 2, 5, 7, 13, 14, and 16 in the bibliography contain lists or contain descriptions of upper Jackson fossils.

The Ocala limestone (restricted) is variable in thickness in Levy and Citrus counties, but probably 150 feet represents the maximum.

**OLIGOCENE**

Suwannee limestone

The name "Suwannee limestone" was proposed by Cooke and Mansfield (11, 1936) for limestone exposed along the Suwannee River from Ellaville almost to White Springs, and to an area of limestone near Brooksville, Hernando County. On the basis of Mollusca, the name was applied by them to a distinctive limestone of entirely different foraminiferal content and lithology cropping out in western Florida. The formation has been correlated with the Lower Chickasawhay formation of Mississippi and as used in western Florida it probably represents both the Byrum formation and the Lower Chickasawhay. The Suwannee
limestone of the peninsular Florida either represents the entire Oligocene with a possible zone at the base that has been correlated with the Marianna limestone, or the lower part of the Oligocene, represented elsewhere by the Forest Hill sand and Red Bluff clay, has not been deposited.

The Suwannee limestone is a tan to light gray, granular, soft, massive to thin-bedded limestone that is typically indurated on exposures. Locally the bed is a mass of foraminifers, mollusks and echinoids. A large part of the assemblage of species of forams found in the Avon Park limestone is duplicated in these beds. The repetition of these species has been explained both as a result of reworking and as a recurrence of species. Most workers interpret the Suwannee species as having recurred and cite their excellent preservation, the abundance of specimens, and the absence of some Avon Park species as proof of recurrence.

Mansfield (27, 1939) reported a maximum thickness of 51 feet of Suwannee limestone in the Crystal River Quarry, stop 16, and placed the contact of the Suwannee with the Ocala limestone at an indurated, clayey band, which he interpreted to lie unconformably upon the Ocala. He gave a list of mollusks and recorded Cassidulus gouldi (Bouve) and Lepidocyclina supra (Conrad) from this bed. Both of these species are recognized as Suwannee and Oligocene guide fossils.

Additional determinations of the thickness of the Suwannee limestone in the outcrop area have not been made.

The results of studies on Suwannee faunas are given in papers, numbers 1, 2, 5, 6, 15, 26, 27, and 28, as listed in the bibliography.
OLIGOCENE

Suwannee limestone

Turritella martinensis zone

F. Stearns MacNeil of the U. S. Geological Survey on U. S. G. S. Oil and Gas Investigations Preliminary Chart No. 29, 1947, recorded the presence of a thin zone at the base of the beds included in the Suwannee limestone above and correlated this zone with the Marianna limestone of western Florida. The bed has not been identified by the writer in the outcrop area, but is probably present. If present at stop 16, it would occur in and just above the clayey bed mentioned by Mansfield (27, 1939) and recorded in bed one of stop 16.

The Oligocene is separated from younger and older beds by well-developed unconformities.

PLEISTOCENE

The Pleistocene sediments of Citrus and Levy counties are distinctive lithologic units separated from each other and from older beds by erosional unconformities. That portion of the "Alachua formation", Pliocene of some students of Florida Stratigraphy, to which E. H. Sellards (Florida Geological Survey, Third Annual Report, p. 32) applied the name "Dunnellon formation" has been included tentatively in the Pleistocene on the basis that the thick and widespread deposits represented by this formation, stop 18, would be most readily transported and deposited during the Pleistocene epoch, a period of great eustatic changes in sea level which were accompanied by adjustments in stream gradients, ground water levels, soil chemistry, land profiles, and climate.

Pleistocene deposits in Florida unerlie and are closely associated with
the formation of broad, relatively flat physiographic features, to which the term "terrace" has been applied. The best discussion of the formation and identification of these features has been given by H. N. Fisk, Louisiana Geological Survey Bulletin No. 18, 1940. In Florida these features have been discussed by several writers, particularly Cooke (8, 1930a; 9, 1930b; 10, 1931; and 15, 1945) and R. O. Vernon (Florida Geological Survey Bulletin No. 21).

The large portion of the Pleistocene deposits are white to light gray, argillaceous sand. The oldest Pleistocene deposit is exposed at stops 17, and 18 and the lithology at these stops is typical. If there are any Pliocene deposits, as such, in the area the writer favors applying the name to the rock represented in the basal part of the section at stop 18, where residuum from older rocks, similar to mantle rock, has been incorporated into sands and argillaceous sands. This is the ore bed from which the hard-rock phosphate is mined.

The Pleistocene beds overlie rocks ranging in age from older Pleistocene to beds of the lower Jackson group, and the _Periarchus_ bed is exposed at both stops 17, and 18.

Younger Pleistocene beds underlie plains at elevations lower than the remnant plains associated with the older Pleistocene beds and probably are composed of sediments reworked from these older beds to which has been added Pleistocene shells and organic matter and any newly derived debris eroded from exposed Tertiary formations.

Four consistent deposits underlying four fairly well-developed plains have been identified in this area. Only the lowest of these contains fossils of Pleistocene age. These deposits range in thickness from a thin veneer in younger beds to a maximum of 100 feet in older beds.
General Aspects

Recent to early Paleozoic sediments are known to be present in Levy County and adjacent areas. Below a thin and patchy veneer of post-Eocene sediments lies 1,200 to 1,700 feet of Eocene, 500 to 800 feet of Paleocene, 1,500 to 3,500 feet of Cretaceous and more than 2,000 feet of Paleozoic rocks.

From near the town of Alachua located high on the pre-Cretaceous Ocala uplift southwesterly to a point near Cedar Keys the Tertiary and Cretaceous sediments thicken 2,600 feet, which is at the rate of 50 to 60 feet per mile. A thick wedge of lower Cretaceous red beds accounts for over half of this thickening and a lesser part is caused by the insertion of thin marine wedges of early upper Cretaceous rocks. The remainder of the thickening occurs in the late Cretaceous and Tertiary beds.

A local source is indicated for the clastic wedges of Cretaceous age in Levy County. The deposits of Austin and Taylor age have faunal and lithologic connections with widespread equivalents around the entire Gulf region. The uppermost Cretaceous and Tertiary deposits have faunal

* Geologist, Coastal Petroleum Company. The writer wishes to thank the members of the field trip committee, Mr. E. H. Rainwater, Mr. H. G. Walters, Mr. L. C. Kirby and Dr. R. O. Vernon for their help in the preparation of this paper. The writer is indebted to Mr. & Mrs. Paul Applin, who made a number of suggestions, and to Dr. Louise Jordan, who reviewed the paper. Permission to publish was granted by Coastal Petroleum Company.
and lithologic connections restricted to equivalents found in South Florida, the Bahamas and Cuba.

Except for beds of Taylor and Austin age, local names based on type wells are used to describe the buried deposits in peninsular Florida. The correlations between these local units and the formations of the western Gulf coast are as yet weak and the correlations with the exposed formations in Cuba are not well established.

Few macro-fossils have been described from the buried post-Taylor beds, thus placing the burden of correlation on micro-fossils, electric logs and lithology. The lithology of the stratigraphic units is more constant than their thickness but both may vary from well to well. Local and regional dolomitization is one handicap in making correlations. Dolomitization masks the original lithologic character, removes the fossil shells and distorts the fossil molds. In Levy County and adjacent area the upper parts of the Avon Park, Lake City, Cedar Keys, and Cretaceous are usually dolomitized beyond satisfactory recognition. Another difficulty arises from the confusing repetition of diagnostic foraminifera, such as the reappearance of Avon Park Coskinolina floridana and Dictyoconus cookei in the Suwannee and the upward range of Austin and Taylor Anomalina sholtzensis into the Lawson. A third handicap to correlation is the long intervals of no samples due to lost circulation frequently encountered in drilling the Tertiary formations.
TERTIARY SYSTEM

Middle Eocene

The middle Eocene was divided by Applin and Applin (2,* 1944) into late middle Eocene and early middle Eocene. The late middle Eocene they further subdivided into two units, an upper unit which they named the Avon Park limestone and a lower unit described as a non-fossiliferous limestone, possibly equivalent in age to the Tallahassee limestone. The early middle Eocene was named by the Applins the Lake City limestone.

Because of the occurrence of a fossiliferous limestone bed at 520 feet in the Coastal Petroleum #1 Ragland, section 16, T15S-R13E, containing Lake City species of Dictyoconus and Archaias, it is apparent that the non-fossiliferous limestone, logged by the Applins from 400 to 811 feet in the nearby Florida Oil and Development #2 Sholtz, section 9, T15S-R13E, can be correlated with the upper part of the Lake City. As presently known the middle Eocene of Levy County is thus composed of a thin Avon Park and a thick Lake City.

Sedimentation was apparently continuous throughout middle and lower Eocene times, as there is no noticeable break at the base of the middle Eocene except for the appearance of a few chert beds and the foraminifera assigned to lower Eocene.

* Numbers refer to articles listed in the selected bibliography.
Lake City Limestone

Applin and Applin (2, 1944) named and described the Lake City limestone as the early middle Eocene stratigraphic unit with faunal and lithologic characteristics as shown in samples from the Lake City well, Columbia County, Florida, No. W-299 of the Florida Geological Survey.

In the vicinity of Levy County the Lake City is 500 to 700 feet thick and composed of two lithologic units which are also present in the type well. The following section is present in the Cedar Keys area:

Upper Unit. 300 feet thick.

Light brown fine textured dolomite with gypsum inclusions and lignite beds. At top and within this unit are zones of brown, partly chalky and fossiliferous, medium crystalline dolomite which grade into beds of cream, dolomitic, fine textured limestone with foraminifera, including Dictyconus americanus (Cushman) and Archaias columbiaensis Applin & Jordan*.

Lower Unit. 400 feet thick.

Brown carbonaceous, gypsiferous, medium crystalline dolomite with many thick beds of cream, glauconitic, chalky, fine to coarse textured limestone having scattered dolomite crystals, some gypsum filled porosity and abundant foraminifera, including the diagnostic Amphistegina lopeztrigoi D. K. Palmer, Gunteria floridana Cushman & Ponton and Lepidocyclina (Pliolopidina) cedarkeysensis Cole.

* Since publishing on this species which Dr. Cushman agreed was an Archaias, Mrs. Applin has had the opportunity to study a larger number of specimens and at present is inclined to place this species in the genus Fallotia H. Douville*. 
Lower Eocene

Oldsmar Limestone

The lower Eocene unit in the subsurface has been named the Oldsmar limestone and described from the "Oldsmar Well", Hillsborough County, Florida, section 13, T28S-R17E (Applin, 1944).

The 400 to 500 feet of Oldsmar limestone present in the subsurface of Levy County is composed of alternating beds of white chalk; white, chalky, fine and fine to coarse textured limestone; light gray and light brown, fine to medium textured dolomite; and a few thin beds of chert and cherty, glauconitic, finely crystalline limestone. The Oldsmar beds are somewhat gypsiferous and locally carbonaceous but not argillaceous.

Usually two or more of the Oldsmar faunal zones can be recognized in the subsurface at any location. These fossil zones have been used for correlation throughout northern peninsular Florida.

I Helicostegina gyralis Barker and Grimsdale*
II Pseudophragmina (Proporocyclina) cedarkeysensis Cole
III Coskinolina elongata Cole
IV Miscellanea nassauensis Applin and Jordan

* As pointed out by Applin (2, 1944), this species has been reported from beds of lower middle Eocene age in Cuba and Mexico.
Paleocene

Cedar Keys Limestone

Cole (6, 1944) applied the local name Cedar Keys to the formation of Midway age "encountered in wells in peninsular and northern Florida from the first appearance of the Borelis fauna to the top of the Upper Cretaceous".

In the area of Levy County the Cedar Keys formation is mostly dolomitized. However, the many spherical voids noticed in cores and the spotted nature of the cuttings below the Miscellanea faunal zone testifies to the one time abundance of Borelis. A few recognizable dolomitized specimens of Borelis can be found in the cuttings within the interval thought to be Cedar Keys. This formation, like the underlying upper Lawson, is in need of a companion type well, free from dolomitization.

The Cedar Keys is a lithologic unit, 600 to 750 feet thick in Levy County, if the formation limits are amplified to include all the light gray and cream, fine-textured dolomite having gypsum filled porosity, anhydrite nodules and a few shale streaks. The upper part of the Cedar Keys as thus defined is characterized by 300 feet of hard dolomite in which a Borelis fauna is known to occur. Much of the dolomite in the lower part of the Cedar Keys is soft and micro-vuggy. Throughout the formation thin zones of altered oolites and breccias are common and dark gray, shaly dolomite has been noted.

From electric log indications it may be assumed that the contact between circulating ground water with surface connections and the trapped connate waters occurs within this formation.
CRETACEOUS SYSTEM

Lawson Limestone

The top of the Cretaceous in Levy County is not well established. Like the overlying Paleocene, the uppermost Cretaceous is dolomitized. Applin and Applin gave the name Lawson limestone to the late Upper Cretaceous unit found in the J. S. Cosden #1 Lawson, section 25, T13S-R20E, Marion County, Florida. (2, 1944). Using round figures, the upper 200 feet in the type well is dolomitized whereas the lower 300 feet is mostly composed of fossiliferous chalk. The Lawson limestone gradually thickens westward into Levy County, being 750 to 800 feet thick in the Cedar Keys area.

The upper Lawson is a white to cream, coralline, fine-textured dolomite with gypsum-filled porosity and few anhydrite nodules. A few Pseudorbitoides have been found in this dolomite. In the Gulf Hammock area, the Cedar Keys limestone appears to be abnormally thick whereas the upper Lawson is thin.

The upper part of the lower Lawson is also dolomitized in Levy County where it occurs as a light brown fine-textured dolomite becoming increasingly coarser and more chalky just above the solid chalk. In the dolomite are many recognizable discoid Lepidorbitoides molds. The chalk part of the lower Lawson contains an abundant Lepidorbitoides fauna of widespread occurrence. A few thin dolomite beds are present near the base of the Lawson chalk.
Beds of Taylor Age

Beds of Taylor age were identified in the Florida subsurface by Applin and Applin in 1944 (2). Previously these beds had been called the *Inoceramus* Zone of the Selma.

The Taylor thickens southwesterly from the crest of the Ocala uplift. In the Cedar Keys area it is composed of 800 feet of chalk and slightly argillaceous chalk. The Taylor and Austin tops are difficult to determine because the micro fauna is sparse and not well known. The first occurrence of abundant *Inoceramus* prisms closely approximates the top of the Taylor, and the appearance of *Anomalina cosdeni* Applin and Jordan, *Bolivinoides decorata* (Jones) *Planulina cedarkeysensis* Cole, and *Stensioina americana* Cushman and Dorsey is indicative of Taylor age.

Near the middle of the Taylor chalk section, a five foot bed of bentonitic shale produces an electric-log and drilling-time marker which can be used for close correlation over an area of several counties.

Beds of Austin age

Beds of Austin age were identified (Applin 2, 1944) as being equivalent to that part of the local section which previously had been placed near the Selma-Eutaw contact. In Levy County and adjacent area a 400 foot interval having varied lithology but fairly constant thickness is considered to be Austin in age. However, the age relationships of the lower 200 feet of these beds are still being studied.

The beds of Austin age can be divided into several lithologic units with distinctive electric log patterns and lithology.
The following zones are described from the Cedar Keys area:

**Upper Shaly Zone.** 100 feet thick.

Gray, slightly argillaceous chalk interbedded with thin layers of white chalk; and brown, white speckled, carbonaceous shale containing long-ranging Cretaceous foraminifera.

**Chalk Zone.** 70 feet thick.

White chalk with few scattered dolomite crystals and foraminifera, as above.

**Middle Shaly Zone.** 20 feet thick.

Gray, in part white speckled, argillaceous, fossiliferous chalk with thin beds of dark gray to black, bituminous shale.

**Sandy Zone.** 100 feet thick.

A variable zone containing the following sandy beds:

Light brown to gray, argillaceous, dolomitic, slightly sandy, chalky, fine limestone.

Light gray, calcareous, medium to coarse grained sand occurring as thin layers in beds of light brown, sandy, dense to fine textured limestone. Many of the quartz grains are milky-blue in color.

Gray argillaceous, silty to sandy chalk with few dolomite crystals.

**Lower Shaly Zone.** 120 feet thick.

Gray, greenish gray and black, in part white speckled, part silty, part lignitic, chalky shale and shaly chalk with Inoceramus and fish remains. A thin basal member is composed of glauconitic, sandy, fine-textured limestone and hard, shaly, dolomitic, fine to coarse sand.

Near the crest of the Ocala uplift in Bradford County the Austin dolomitic sand grades into granular dolomite with some anhydrite. Here beds of Austin age rest directly on unweathered Paleozoic rocks. It is interesting to note that, as the clastic source area became restricted in Austin time, sand and dolomite were deposited concurrently.
Atkinson Formation (Beds of Eagle Ford and Woodbine Age)

In Alabama, Georgia and north Florida, the basal Upper Cretaceous beds are called the Atkinson formation (Applin 3, 1944) which are correlated, in part, with the Eagle Ford and, in part, with the Woodbine formations of Texas. In earlier reports the thin wedge of Atkinson which is present in Levy County has been classified as Eutaw (5, 1942) and Tuscaloosa (2, 1944).

The Atkinson formation as at present identified in the subsurface of Levy County may be divided into two lithologic units, both of which are marine. In descending order, the units are:

Shale Unit. 0-65 feet thick.

Dark gray, finely micaceous, flaky, poker-chip shale with a few fine sandy laminae and fish remains.

Sand Unit. 0-30 feet thick.

Light gray to white, dolomitic, medium to very coarse-grained sand with pebble zones, phosphate pellets and shark teeth.

Locally, in the Levy County area, it seems possible that the Atkinson deposits may have been derived from Lower Cretaceous red-beds. Many of the quartz grains are light red and yellow in color. The conglomerate zones have many light green, fine sandy, dolomite pebbles identical in lithology with beds of the underlying continental Lower Cretaceous. Locally, so much continental material may be present in the lower unit of the Atkinson that the presence of the marine sand is masked in cuttings and its electric log character damped.
Beds of Lower Cretaceous Age

Following the usage of some geologists in Mexico, Campbell (4, 1939) divided the Cretaceous of Florida into three parts which he termed Eo-Cretaceous, Middle Cretaceous and Upper Cretaceous. In a Lake County well, section 17, T24S-R25W, Campbell regarded, "the miliolid limestones at 5383 feet, some beds of anhydrite, and the red sands and gravel" as being Middle Cretaceous in age. This unit he correlated with the exposed Lower Cretaceous of Texas. Pressler (29, 1947) tentatively applied the term Middle Cretaceous to that section between unconformities at 8,200 and 9,700 feet in Humble's #2 Gulf Coast Realities at Sunniland, and he correlated the South Florida Middle and Lower Cretaceous with the pre-Tuscaloosa continental Cretaceous around the northern side of the Ocala uplift. In Levy County and adjacent area, a thick wedge of continental red-beds rests on an apparently weathered Paleozoic surface. In the Cedar Keys area, the thickness of this wedge is 1,500 feet.

In general, the sand in the upper part of these continental beds is varicolored, micaceous, shaly, fine to medium grained and in part dolomitic, whereas the sand in the lower part is very coarse grained and in some places cemented by anhydrite. Claystones in the continental beds are frequently color-mottled, silty to sandy and dolomitic. A few color-mottled, sandy, dense-textured dolomites occur. At least three boulder zones and a coarse basal conglomerate are present in the Lower Cretaceous deposits in the Cedar Keys area. The boulder zones contain many light green, reddish or white quartzite pebbles and boulders and also a few pebbles of black shale and varicolored clay.
PALEOZOIC SYSTEM

Beds of Paleozoic Age

From the rarely fossiliferous pre-Cretaceous, hard, micaceous, quartzitic sandstone of Dixie County, Dr. B. F. Howell (22, 1947) has identified a lower Paleozoic brachipod belonging to the genus *Lingulepis* which has characteristics in common with species known only from the late Cambrian and early Ordovician. The pre-Cretaceous sediments encountered in the area of the Ocala uplift have been assigned to Paleozoic-metamorphics (21, 1928), Jurassic and Mississippian (4, 1939), Triassic (6, 1944) and Carboniferous (15, 1945).

In two wells in Levy County pre-Cretaceous rocks have been penetrated for a short distance. In the Gulf Hammock area, below a possible weathered zone, is a gray laminated, micaceous, quartzitic sandstone with the bedding cut by sandstone-filled tubes. In the Cedar Keys area, below a weathered zone, is a black, pyritic, fine-textured shale. Since the *Lingulepis* described by Howell was found in a sandstone, it is possible that the black shale belongs to a different part of the Paleozoic system. Several tests in the northern part of the Ocala uplift have penetrated black shale, somewhat similar to that found at Cedar Keys. In the pre-Cretaceous black shale of Nassau County, R. S. Bassler tentatively identified an ostracod belonging to the genus *Amphissites* (range - Devonian to Permian). In adjacent areas north, east and south of Levy County, 800 to 2,250 feet of quartzitic sandstone has been drilled in deep tests without encountering older rocks. The nearest occurrence of crystalline basement is the granite located below Cretaceous beds in a Lake County well.
The Floridian Plateau as described by Vaughan (34, 1910) includes peninsular Florida and the submerged sea bottom on both sides to a depth of 300 feet. The medial axis of this 500 mile long and 300 mile wide continental extension roughly parallels the present west coast of Florida. This topographic axis passes through Levy County at Cedar Keys.

Located in the northern part of the Floridian Plateau is a broad anticlinal feature approximately 200 miles long and 150 miles wide. As early as 1884 Eugene A. Smith (33), then State Geologist of Alabama, described this structural feature as being outlined by Miocene sediments and with an axis trending along the west coast of Florida. N. S. Shaler (31), in 1890 first referred to this feature as the Florida uplift and compared it in size to the Cincinnati arch. George C. Matson (28, 1909) of the Florida Geological Survey described this same broad uplift or arch as having 100 feet of reversal in beds exposed between Brooksville and Live Oak.

Cooke (15, 1945) considers Levy County as occupying the central part of the exposed Ocala uplift. According to the Applins (2, 1944), "on the Taylor and early middle Eocene maps, the highest part of the Ocala uplift centers around Columbia and Suwannee Counties." On the pre-Cretaceous map, the Ocala uplift more nearly centers in Union County. If there is an igneous high in the area of the Ocala uplift, it remains to be located. As presently known, the core of the Ocala uplift is composed of a thick series of relatively flat-lying early Paleozoic sandstones. These subsurface high points have no doubt been somewhat displaced from their original geographic position as a result of unequal earth movements as well as unequal erosion.

#The term, Ocala uplift, was used as early as April 1920 in a U.S. Geol. Survey Press Bull., reprinted in Florida Geol. Survey 13th Annual Report
Vaughan (14, 1910) gave the name Orange Island to the emergent part of the Ocala uplift. In Miocene time, this Island extended from Gainesville to Tampa and from Ocala to the west coast and possibly beyond. Orange Island was separated from the mainland by Suwannee Strait (13, Dall 1892). The writer believes that many of the stratigraphic and structural conditions now existing around the Ocala uplift can be explained by the repeated occurrence of Orange Island.

As mapped near the surface, the Ocala uplift is a broad regional high with dips ranging from two to five feet per mile on the flanks. Mapped on pre-Cretaceous beds, the uplift has flanking dips ranging from 50 to 60 feet per mile. Local anticlinal structures are present in surface beds and abnormal dips are known to exist in the subsurface. The recurrence of Orange Island during early Austin and Atkinson time with well developed, marine, shore-line sands, sea-ward thickening formations and possible truncations should combine in producing conditions favorable for the formation of stratigraphic type traps.

Faulting may be present in the Tertiary and Cretaceous sediments flanking the Ocala uplift. Faulting in the Paleozoic sediments has been suspected from a study of geophysical maps showing an Appalachian-like NE-SW trend in rocks found to be essentially flat where encountered by the drill. From evidence presented by well-cores, the Paleozoic rocks are known to be fractured. Part of the fractures are open and part are filled with minerals, such as, pyrite, limonite, quartz, calcite and anhydrite. In one well, circulation was lost in the porosity developed along a Paleozoic fracture zone.
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