number of facts, and based almost entirely on "model" experiments. I shall later have arguments about that with some of you—but not tonight.

Of those of you who have followed me thus far, I am sure that many will agree with me that biochemistry by analogy may be a most dangerous adventure. Certainly, any conclusions reached by such a process should be most carefully controlled by more direct experiments, as soon as these become possible.

But I can at least hope to have some of you agree that processes of the type outlined possess a considerable fascination, which is perhaps not merely that of their danger, and that they may at the very least be profitable for their power to suggest theories which must later be tested more rigorously.

PALEONTOLOGY.—*Oligocene faunas from the lower and upper beds on the A. L. Parrish farm, Washington County, Florida.*[1] W. C. MANSFIELD, U. S. Geological Survey.

The locality from which the fossil material, on which this paper is based, was obtained is in a small ravine, the stream in which disappears in the bottom of a sink, back of the house on the A. L. Parrish farm, about 3½ miles southeast of Wausau, Washington County, Florida. The first reference to this locality is given by Mossom (1). He reports twenty feet of cream-white soft limestone in a sink at this locality. He states that the contained fossils indicate, based on a letter of Miss Julia Gardner, that it is older than the Chipola marl and probably belongs to the Tampa. An analysis of the limestone as reported by Mossom, which probably is from the lower part of the exposure, showed a percentage of 94.7 of calcium carbonate. The limestones were not differentiated.

The second reference is by Cooke and Mossom (2). They state that the lower part of the limestone is white, finely granular, apparently pure, and contains few fossils; the upper part is more argillaceous and carries an abundant fauna, which appears to be of Tampa age.

The third reference is by Dr. T. W. Vaughan (3a). Doctor Vaughan states:

"The third collection, sink on A. L. Parrish farm, 3½ miles southeast of Wausau, Washington County, Florida, contains poorly-preserved specimens, but I think a definite opinion as to the geologic age is justified. One specimen undoubtedly represents the same species as Cushman's *L. chattahoocheensis*

[1] Received January 24, 1938.

and another is clearly the one which I have been calling *L. gigas* var. Other specimens seem to represent the same species as the smaller, thin, flattish or saddle-shaped megalospheric specimens found near Duncan Church. Therefore, I have no hesitancy in expressing the opinion that this material is also Glendon, middle Oligocene age."

It is not stated from which bed the foraminifera were collected, but evidently they came from the lower bed.

The fourth reference is by Mansfield (4). In referring to this locality Mansfield writes:

"The limestone is separable into two beds, the lower of which is believed to be of the same age as that of the limestone exposed at Duncan Church." In reference to the fauna of the upper bed the writer states "this fauna has not been studied sufficiently to determine definitely its relation to the Tampa fauna."

The first lot of fossils collected from the A. L. Parrish farm was obtained by F. G. Clapp in 1920 (U.S.G.S. No. 8854–5–6). Although his station numbers record different levels in a "40-foot outcrop," all the fossils appear to have been taken from the upper fossiliferous bed; the second lot by Dr. C. W. Cooke and Dr. Julia A. Gardner in 1921 (U.S.G.S. No. 10461); and a third lot by the author and G. M. Ponton, 1932, and F. Stearns MacNeil, 1936, and C. W. Mumm, 1937 (U.S.G.S. No. 12723).

An examination by the writer of the section at this place revealed the existence of two beds. The lower bed consists of a soft, nearly white limestone composed almost entirely of large foraminifera but without any observed mollusks. About 8 feet of this bed is exposed in the lowest part of the sink at the place where a small stream disappears. The upper or overlying bed, which may be as much as 25 feet thick here, consists of a limestone containing many mollusks preserved as molds. As there has been much slumping of the strata surrounding the sink, it is difficult to determine with exactness the original position of the upper fossiliferous bed, but it appears to be near the top of the section here. No unconformity was observed between the two beds, the separation being based on the differences in the lithologies and the faunas.

The photographs used for illustrations were made by Nelson W. Shupe, and the prints were retouched by Frances Wieser, both of the U. S. Geological Survey.

Comparison of species from the A. L. Parrish farm with species in outside formations:

MOLLUSKS (upper bed)

SPECIES FROM A. L. PARRISH FARM	SPECIES IN OUTSIDE FORMATIONS
Terebra sp.	Not determined
Conus, ? aff. *C. cookei* Dall	*Conus cookei*, Flint River formation, upper Oligocene
Conus aff. *C. imitator* Brown and Pilsbry	*Conus imitator* Brown and Pilsbry, Baitoa formation, Dominican Republic, and Gatun formation, Canal Zone.
"*Drillia*" sp.	Not determined.
**Olivella* aff. *O. mississippiensis* Conrad	*O. mississippiensis*, Oligocene
**Mitra* sp.	Cf. undescribed species from the Flint River formation, upper Oligocene.
**Phos parrishi*, n. sp.	Not determined
**Cassis* sp.	Probably near an undescribed form from the Flint River formation.
Ficus aff. *F. mississippiensis* Conrad	*F. mississippiensis*, Oligocene
Strombus aff. *S. liocyclus* Dall.	*S. liocyclus*, Tampa limestone
**Clava parrishi*, n. sp.	Not found elsewhere
†*Turritella gatunensis* Conrad	Vamos-a-Vamos bed and lower bed of Gatun formation; also Chickasawhay
Xenophora sp.	Not determined
Ampullina? sp.	Not determined
**Anadara macneili*, n. sp.	*A. dodona* Dall, Oak Grove sand
**Anadara mummi*, n. sp.	*A. santarosana* Dall, Oak Grove sand; Chickasawhay
Thracia?	Not determined
Crassatellites sp.	Not determined
Venericardia sp.	Not determined
Phacoides (*Miltha*) cf. *chipolana* Dall	*P. chipolana*, Chipola formation and Oak Grove sand
Divaricella sp.	May be the same as undetermined species from upper bed at Falling Water
†*Cardium* aff. *C. hernandoense* Mansfield	*C. hernandoense*. Suwannee limestone; also probably Chickasawhay
**Chione* cf. *C. spenceri* Cooke	Tampa limestone at Cherokee sink and upper bed at Falling Water
Semele aff. *S. smithii* Dall	*Semele smithii*, Chipola formation
Psamosolen aff. *P. sancti-dominica* Maury	*P. sancti-dominica*. Bowden marl. Jamaica; Cercada and Gurabo formation, Dominican Republic
Spisula? sp.	Not determined
Panope cf. *P. parawhitfieldi* Gardner	*P. parawhitfieldi*, Oak Grove sand, Florida

* Rather abundant. † Very abundant.

SPECIES FROM A. L. PARRISH FARM	SPECIES IN OUTSIDE FORMATIONS
Teredo? *incrassata* Gabb	Suwannee limestone, Oligocene; Chickasawhay; Cercado formation, Dominican Republic, Miocene

The following notes on the Foraminifera from the upper and lower beds are by Lloyd G. Henbest of the U. S. Geological Survey:

Two collections of limestone from an outcrop in a sink on the A. L. Parrish farm, 3½ miles southeast of Wausau, Washington County, Fla., were recently submitted to me by W. C. Mansfield for age determination. These two collections represent two horizons. The lower one (U.S.G.S. 13857) is a very soft, porous, friable limestone containing an abundance of Orbitoididae and nullipores. The collection from the upper horizon (U.S.G.S. 12723) consisted of about 25 small pieces of well-indurated matrix that originally surrounded shells of Mollusca.

Lower bed.—Collection 13857, from the lower bed, contains *Lepidocyclina* (*Lepidocyclina*) *yurnagunensis* Cushman, *L.* (*Eulepidina*) *undosa* Cushman, *L.* (*Eulepidina*) *favosa*? Cushman. The search has not been exhaustive, and other species may be present.

This fauna is identical with that described by W. Storrs Cole (3). On p. 21 Cole states that a collection from a sink on the A. L. Parrish farm, 3½ miles southeast of Wausau (same locality as 13857) was also a subject of study and definitely implies that it contains the same orbitoidal fauna as that from the Duncan Church locality. Although Cole does not state whether his collection was derived from the upper or lower parts of the section, the detailed similarity of the orbitoidal fauna in our collections from the same locality indicates that his collection also came from the lower bed.

Cole, quoting opinions by Vaughan (3, pp. 21, 22) concludes that the Duncan Church orbitoidal fauna definitely represents Oligocene age and strongly indicates the middle Oligocene. From my own brief study of this collection I find no evidence for contradicting or materially adding to that already presented by Cole; accordingly, there is no need to review his argument here.

Upper bed.—I find in this material (collection 12723) numerous scraps of echinoderm plates and a few small nullipore colonies. Miliolids (including *Quinqueloculina*, etc.), *Amphistegina*?, *Archaias*??, and a few other forms recognizable only as foraminifers were intersected by the sections. In these exposures their specific and in some instances

even their generic identity is not definitely determinable. A peculiar, uniserial peneroplid was encountered whose generic position is uncertain and may represent a new genus. The foregoing list of forms merely suggests Cenozoic age and nothing closer. Of more significance, however, are a few more or less worn fragments of a minute species of *Lepidocyclina*. Fewer unworn or incompletely exposed but subgenerically unidentifiable specimens were found. Two isolated proloculi of *Lepidocyclina* (*Nephrolepedina*) and two specimens of a minute species very closely related to *Lepidocyclina* (*Lepidocyclina*) *yurnagunensis* were found. The two specimens of *L.* (*L.*) *yurnagunensis* differ from those described by Cole from the Duncan Church locality by being more nephrolepidine. Their slightly smaller size may be accounted for as merely individual variation. Another poorly preserved specimen in equatorial section resembles *L. supera*, but a definite identification cannot be made without better sections.

If these lepidocyclines from the upper bed are indigenous and *not erratics derived from the lower bed*, the age is also Oligocene. A closer age determination should not be attempted at the present time on this fragmentary evidence. The other Foraminifera cannot be regarded as supporting or contradicting this evidence, because in their unrecognizable condition they merely indicate Cenozoic age and nothing more exact.

It is probably significant in this connection that though various genera of Foraminifera, including a peneroplid, are present, the faunule does not include any of the highly specialized Peneroplidae that characterize the Tampa and Chipola Miocene in the same general region.

FAUNAS OF THE LOWER AND UPPER BEDS

Lower bed.—So far only specimens of Foraminifera have been collected from the lower bed. Relying on the determinations of these Foraminifera by Cole, Vaughan and Henbest, the age evidently is middle Oligocene.

Upper bed.—Although the sculpture of the external molds of the mollusks has been well preserved, impressions taken of these molds reveal in most cases only parts of the original shell and for that reason the relationships to better preserved specimens from outside localities are difficult to determine.

The molluscan fauna is interesting because a number of forms show a relationship either to the lower part of the Gatun formation or to the Vamos-a-Vamos beds of the Canal Zone and to certain

faunas of the West Indies, thereby probably indicating a migration of the faunas either northward or southward, during this or a closely related geological epoch.

The age of the fauna is believed to be not later in time than that of the Tampa limestone, lower Miocene, or earlier than that of the upper part of the Flint River formation (upper Oligocene). However, the evidence, so far deduced, for placing it in the upper Oligocene is stronger than placing it in lower Miocene, Tampa limestone.

The absence of certain genera of mollusks as *Pecten* and others make the correlation with other deposits that contain these genera more difficult. The possibility of procuring some of these lacking genera and better preserved specimens in the future would aid in determining more precisely the age of the bed.

The molluscan forms that indicate an Oligocene age are: *Conus*,? aff. *cookei; Olivella* aff. *mississippiensis; Cassis* sp.; *Anadara macneili* (an intermediate form between *A. lesueuri* (Dall), an Oligocene species, and *A. dodona* Dall from the Oak Grove sand, but nearer the former); *Cardium hernandoense* Mansfield, Suwannee limestone, upper Oligocene; *Teredo*? *incrassata* Gabb, and perhaps others.

It is the purpose to discuss the Chickasawhay marl of Mississippi and Alabama in this paper only in so far as to indicate the probable relationship of the fauna under discussion with it.

So far as can be observed, the faunas in the upper bed at the A. L. Parrish farm and that of the Chickasawhay are largely contemporaneous. The same *Turritella, Arca, Cardium, Chione* and *Teredo* appear to occur in both.

Two forms that might suggest Tampa age are: *Strombus* aff. *liocyclus* Dall, and *Chione* cf. *spenceri* Cooke.

The nearest locality to the A. L. Parrish farm at which the Tampa limestone fauna occurs is in bed No. 2 at Falling Water, Washington County, a distance of 9 or 10 miles to the north. At Falling Water only one small specimen of a *Chione* similar to that at the A. L. Parrish farm has been collected; this form is rather abundant at the A. L. Parrish farm. *Chlamys crocus* Cooke, a characteristic Tampa limestone species, occurs at Falling Water. The sediments at Falling Water consist mainly of a coarse grained quartz sand, whereas the material of the upper bed at the A. L. Parrish farm consists of a limestone.

Two forms, *Phacoides* cf. *chipolana* Dall and *Panope* cf. *parawhitfieldi* Gardner, suggest a relationship to the Chipola marl or to the Oak Grove sand. The nearest locality to the A. L. Parrish farm

at which Chipola fossils have been collected is in the bed of Econfina River, Bryant Scott's farm, Bay County, sec. 28, T. 2 N., R. 12 W., about 7 miles southeast. This fauna has been placed at the top of the Chipola marl by Dr. Julia A. Gardner (5). This fauna, however, is unlike that at the A. L. Parrish farm.

The fauna of the Baitoa formation, Dominican Republic, contains some forms allied to those at the A. L. Parrish farm. A small cone from the A. L. Parrish farm is similar to *Conus imitator* Brown and Pilsbry (from Baitoa formation) and *Clava parrishi* n. sp. from A. L. Parrish farm is also closely related to an unnamed species from the Baitoa formation.

The *Turritella*, which I have identified as *T. gatunensis* Conrad, is the most abundant species at the A. L. Parrish farm. *T. gatunensis* occurs both in the Vamos-a-Vamos beds (dark-colored beds) and the lower part of the Gatun formation of the Panama Canal zone. Woodring (6) places the Vamos-a-Vamos beds in the lower part of the middle Miocene. The Vamos-a-Vamos beds probably are stratigraphically lower than middle Miocene.

Concerning the fragmental and poorly preserved specimens of foraminifera from the upper bed as determined by L. G. Henbest in this paper, he states "if the *lepidocyclines* found in this bed are indigenous *and not erratics derived from the lower bed*, the age is Oligocene."

A tentative conclusion deduced from a study of the faunas of the upper bed, would indicate that it is Oligocene, and the bed enclosing the faunas is contemporaneous, in part at least, with the Chickasawhay marl of Mississippi and Alabama, the Flint River formation of Georgia, the Suwannee limestone of Florida and the Vamos-a-Vamos beds of the Canal Zone.

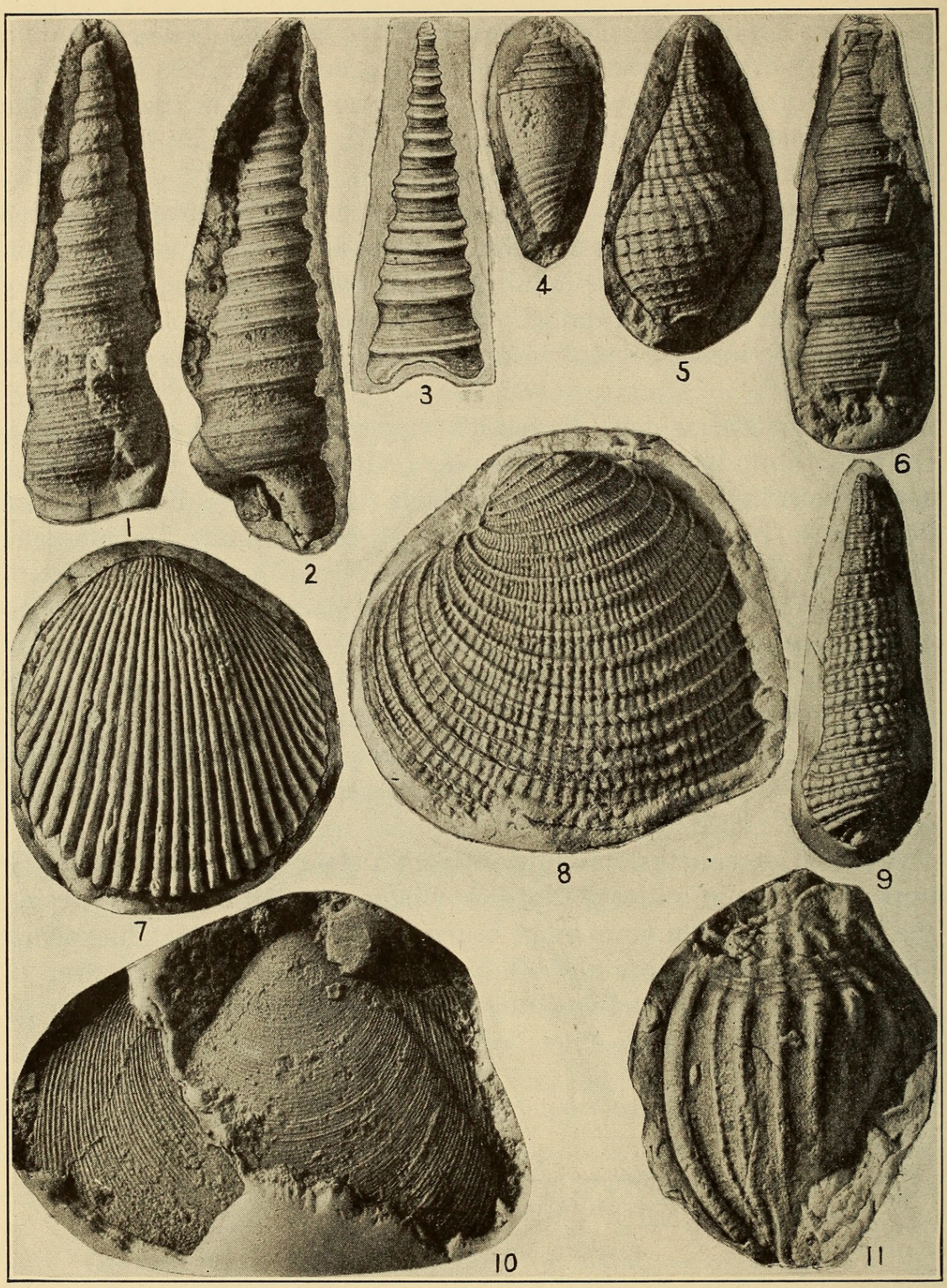
SPECIES OF MOLLUSKS FROM THE UPPER BED

Terebra sp.

One external mold; species not determined.
Occurrence: A. L. Parrish farm.

Conus sp.? aff. *C. cookei* Dall

One rather large external mold showing part of last whorl. The sculpture consists of rather wide spiral bands separated by narrow impressed lines. The nature of the sculpture suggests a relationship to *Conus cookei* Dall from the Flint River formation (upper Oligocene) of Georgia but this relationship cannot be fully confirmed with the material at hand.
Occurrence: A. L. Parrish farm.



Figs. 1, 2, 3, 6.—*Turritella gatunensis* Conrad. Squeezes: 1, ×4; 2, ×3; 3, ×5; 6, ×2. U. S. Nat. Mus. No. 497647. Fig. 4.—*Conus* aff. *C. imitator* Brown and Pilsbry. Squeeze, ×3. U. S. Nat. Mus. No. 497643. Fig. 5.—*Phos parrishi* Mansfield. Squeeze of holotype, ×3. Fig. 7.—*Cardium* (*Trachycardium*) aff. *C. hernandoense* Mansfield. Squeeze, ×2. U. S. Nat. Mus. No. 497653. Fig. 8.—*Chione* cf. *C. spenceri* Cooke. Squeeze, ×3. U. S. Nat. Mus. No. 497654. Fig. 9.—*Clava parrishi* Mansfield. Squeeze of holotype, ×2. Fig. 10.—*Phacoides* (*Miltha*) cf. *P. chipolana* Dall. Squeeze, ×3. U. S. Nat. Mus. No. 497652. Fig. 11.—*Cassis* sp. Squeeze, ×2. U. S. Nat. Mus. No. 497645. (smaller specimen). All enlargements approximate.

Conus aff. *C. imitator* Brown and Pilsbry Fig. 4

Two external molds of small specimens. These specimens have a rather high spire. The whorls are carinate. These specimens closely resemble *Conus imitator* Brown and Pilsbry, a species from the Baitoa formation, Dominican Republic. *C. imitator* also occurs in the Gatun formation of the Canal Zone.

Occurrence: A. L. Parrish farm.

"Drillia" sp.

One incomplete external mold, species not determined.

Occurrence: A. L. Parrish farm.

Olivella aff. *O. mississippiensis* Conrad

External molds of a rather large species. These may be related to *Olivella mississippiensis* Conrad, a Vicksburg, Oligocene species.

Occurrence: A. L. Parrish farm.

Mitra sp.

External molds of large shells of *Mitra*. The sculpture of the undetermined species consists of rather widely spaced alternating stronger and weaker spirals over the whole shell. It appears to be closely related to an undescribed species from the Flint River formation of Georgia.

Occurrence: A. L. Parrish farm.

Phos parrishi Mansfield, n. sp. Fig. 5

Shell of moderate size with an acute spire and rather large body whorl, both spirally and axially sculptured, the axials being more strongly developed on the spire than on last whorl. Sculpture of penultimate whorl consists of 4 primary spirals interposed by a single secondary thread. Two secondary threads lie below the suture. Axials stronger than spirals and are weakly nodulated by the overrunning primary spirals.

Holotype (U.S.Nat.Mus. No. 497644) measures: Length about 15 mm; diameter, about 8 mm.

Type locality: A. L. Parrish farm, Washington County, Florida.

Cassis sp. Fig. 11

Internal molds of rather large shells and incomplete external molds of smaller shells are in hand. These larger and smaller specimens, however, may not represent the same species. The smaller external molds have rather strong axials on the body whorl and in this respect indicate some relationship to *Cassis sulcifera* Sowerby but the ribs are stronger than on this species and the spire is higher. The undetermined specimens probably are more closely related to a rather high-spired form in the Flint River formation of Georgia wrongly identified by Dall as *C. sulcifera*, but the material in hand does not warrant at present uniting the two forms under the same species.

Occurrence: A. L. Parrish farm.

Ficus sp. aff. *F. mississippiensis* Conrad

Incomplete external and internal molds showing a medium sized form of the original shell. With the material in hand it is difficult to determine whether the unidentified form is closer to *Ficus mississippiensis* Conrad,

a Vicksburg, Oligocene species, or to a larger form from the Chipola marl. The secondary spirals appear to be closer to the Chipola species. However, it may be more closely related to the Vicksburg species. It is larger than most of the specimens from the Oligocene and nearly as large as the Chipola specimens.

Occurrence: A. L. Parrish farm.

Strombus aff. *S. liocyclus* Dall

The material consists of incomplete external molds. The body whorl is without tubercles. Sculpture on the spire consists of broad ribs and spirals situated below the suture. The unnamed species appears to be closely related to *Strombus liocyclus* Dall from the Tampa limestone although it may not be that species.

Occurrence: A. L. Parrish farm.

Clava parrishi Mansfield, n. sp. Fig. 9

Shell of medium size, slender; nucleus not preserved. Whorls nearly straight in outline and shallowly constricted by a distinct suture. Sculpture consists of both spirals and axials—the axials being a little weaker than the spirals. The spiral sculpture on the spire whorls consists of three narrow, equally spaced, uniformly sized, nodulous bands and a single intervening thread. A spiral thread, a little stronger than intervening ones, lies adjacent to and behind the suture. Last whorl with 6 nodulous primary spirals, all intercalated with a single secondary thread except the basal two, which have two secondary threads instead of one. Axials, probably about 15 in number, arcuate, weaker than spirals and extend across each whorl.

Holotype (U.S.Nat.Mus. No. 497646) measures about 26 mm (including broken off tip which probably amounts to about 3 mm); diameter, about 8 mm.

Type locality: A. L. Parrish farm, about 3½ miles southeast of Wausau, Washington County, Fla.

Clava parrishi n. sp. is closely related to an unnamed species from the Baitoa formation, lower Miocene, from the Province of Santiago, Dominican Republic, stations 8668 and 8558. The upper spiral on the Baitoa species is a little stronger than the others whereas this spiral on the new species here described is no stronger than the others.

"Cerithium" praecursor Dall, a species in the Tampa limestone, has a stouter shell and more secondary spirals than the new species here described.

Occurrence: Type locality, quite common. Not found elsewhere.

Turritella gatunensis Conrad Figs. 1–3, 6

Specimens of *Turritella* are very abundant at the A. L. Parrish farm. The depression between the two raised spirals on each whorl on these specimens begins on the early part of the shell and continues over the later whorls. The depression on the early whorls appear to characterize the earliest forms referred to *Turritella gatunensis* from later forms which have a medial carina on the 7 or more earliest whorls which is formed by the upper spiral —the lower spiral, which is developed later, gradually strengthens anteriorly.

In examining specimens referred to *T. gatunensis* from G formations of the Canal Zone two varieties are observed. In one variety, which occurs in the Vamos-a-Vamos bed and in lower faunal zone of the Gatun forma-

tion, a depression develops on the early whorls whereas in the second variety occurring in the middle faunal zone of the Gatun formation at the Gatun dam (Station 8365 and other stations) the earliest whorls are medially carinated, the anterior spiral coming in later.

The form at the A. L. Parrish farm more closely resembles those from the Vamos-a-Vamos and in lower faunal zone of the Gatun formation.

The Culebra formation of the Panama Canal Zone contains a different species of *Turritella*.

Turritella gatunensis caronensis Mansfield from the Brasso beds of Trinidad perhaps is more closely related to those in the middle faunal zone of the Gatun formation.

Turritella gatunensis blountensis Mansfield from the upper middle Miocene of Florida have weakly carinated early whorls, a shallower suture and lower primary spirals than those in the Gatun formation.

Two external molds showing the early parts of a *Turritella* have been collected at Station 13396, above the mouth of Limestone Creek, near the middle of sec. 25, T. 9 N., R. 7 W., Wayne County, Mississippi, by Roy T. Hazzard. These probably belong to *Turritella gatunensis* Conrad. Specimens from Station 1/52, Gainstown Ferry, Clarke County, Alabama, referred by Cooke (7) to the Chickasawhay marl member of the Byram marl, are the same as those at the A. L. Parrish farm.

Xenophora sp.

External mold of base, species not determined.

Occurrence: A. L. Parrish farm.

Ampullina? sp.

Internal molds, genus not determined.

Occurrence: A. L. Parrish farm.

Anadara macneili Mansfield, n. sp. Figs. 12, 17, 18

Shell small, ovate, moderately high, inequilateral, and probably nearly equivalve. Beaks weakly depressed medially. Left valve narrowly rounded over anterior side, weakly truncate on posterior side and broadly rounded over the middle. Ribs over beak and early part of the shell single and beaded and separated by interspaces about as wide as the ribs. The ribs begin to divide at about the highest part of the shell forming two closely spaced ribs, the sulcation becoming deeper in advancing ventrally. Near the posterior border each bi-partate rib is shallowly sulcated forming four radials. Right valve, so inferred, has similar ribs as left.

Holotype, left valve (U.S. Nat. Mus. No. 497648) measures length about 25 mm; width about 20 mm; height about 8 mm.

The paratype (Fig. 17) shows only the anterior half of the shell. The species is described from squeezes taken from exterior molds.

Type locality: A. L. Parrish farm, 3½ miles southeast of Wausau, Washington County, Fla.

Compared with *A. lesueuri* (Dall), a Vicksburg species, the new species is larger, relatively higher and wider, with a more medially impressed beak.

The general outline of the shell of the new species, and the character of its ribbing agree closely with that of *A. dodona* Dall, an Oak Grove species. It appears, however, to be an intermediate form between the Vicksburg species and the later species.

The species is named after F. Stearns MacNeil of the U. S. Geol. Survey.

Anadara mummi Mansfield, n. sp. Fig. 14

Shell rather small and moderately high with a truncate posterior side. Ribs slightly wider than interspaces, strongly beaded, single over the umbo but divided over the lower half of the shell. The shell is relatively higher and stouter, more truncate on the posterior side than *Anadara macneili*, and the ribs show no indication of breaking up into four parts.

Holotype, left valve (U. S. Nat. Mus. No. 497651) measures: Length, about 20 mm; width, about 20 mm; height, about 9 mm.

Type locality: A. L. Parrish farm, 3½ miles southeast of Wausau, Washington County, Florida.

The new species appears to be related to *A. santarosana* Dall, an Oak Grove species, apparently differing from the latter in having a smaller shell, with the incisions on the ribs earlier developed.

Compared with *Anadara hypomela silicata* Mansfield, a Tampa limestone subspecies, the new species has a shorter shell, a more truncate posterior side and more beaded ribs.

Other occurrence: Specimens collected at Station 13239, NW¼ sec. 17, R. 8 N., T. 5 W., Bucatunna Creek, Wayne County, Mississippi, appear to belong to the same species.

The species is named after C. W. Mumm of the U. S. Geol. Survey.

Thracia? sp.

Fragment showing internal mold. The ribbing suggests that it may belong to the genus *Thracia*.

Occurrence: A. L. Parrish farm, Washington County, Florida.

Crassatellites sp.

One internal mold, species not determined.

Occurrence: A. L. Parrish farm, Washington County, Florida.

Venericardia sp.

External molds of incomplete shells. Species not determined.

Occurrence: A. L. Parrish farm, Washington County, Florida.

Phacoides (*Miltha*) cf. *P. chipolana* Dall Fig. 10

External mold of an incomplete left valve. The fine concentric sculpture indicates that it is either very close to or the same as *Phacoides* (*Miltha*) *chipolana* Dall, a species occurring in the Chipola marl and the Oak Grove sand.

Occurrence: A. L. Parrish farm, Washington County, Florida.

Divaricella sp.

External mold of an incomplete shell. Species not determined. This may be the same undetermined species as occurs in the upper bed at Falling Water.

Occurrence: A. L. Parrish farm, Washington County, Florida.

Cardium (*Trachycardium*) aff. *C. hernandoense* Mansfield Figs. 7, 13

External and internal molds of several specimens, which probably represent a single species. The ribs are rather closely spaced, triangular in outline and without any observed granules. The specimens have more ribs than

Cardium precursor Dall, a species from the Oligocene at Vicksburg, Miss., but show some affinity to it.

Cardium (*Trachycardium*) *hernandoense* Mansfield from the Suwannee limestone, upper Oligocene, appears to be closely related to it.

Occurrence: A. L. Parrish farm, Washington County, Florida.

Other occurrence: External impressions from Station 13396, Hillside above the mouth of Limestone Creek, Wayne County, Miss. (sec. 25, T. 9 N., R. 7 W.) may be closely related to the unnamed species.

Chione cf. *C. spenceri* Cooke Figs. 8, 16

Material consists mainly of a number of external molds. These external molds compare closely with *Chione spenceri* Cooke from Antigua but specific identity with that species is not confirmed.

The molds show a moderately large shell, inflated, about as long as wide, and weakly depressed behind the middle. Sculpture consists of erect, concentric lamellae and rather strong radials. These lamellae are about 2 millimeters apart over the whole shell. These radials undulate the margins of the lamellae and ornament their ventral slopes and extend across the rather wide interspaces.

Occurrence: A. L. Parrish farm, Washington County, Florida.

Other occurrence: Tampa limestone at Cherokee sink, Wakulla County (two small valves); upper bed at Falling Water, Washington County, Fla. (one small valve). Although the specimens from the Tampa limestone are smaller than the specimens from the A. L. Parrish farm, the sculpture on the specimens from the three localities appear to be identical.

The unidentified species differs from *Chione bainbridgensis* Dall, a species occurring in the Flint River formation, upper Oligocene of Georgia, in having (especially over the umbonal area) wider spaced concentric sculpture and stronger radials.

Semele aff. *S. smithii* Dall

The material consists of internal and external molds. The concentric sculpture consists of closely spaced lamellae. The undetermined species appears to be related to *Semele smithii* Dall from the Chipola formation. It has a smaller shell than *Semele chipolana* Dall and the concentric sculpture on it is finer but it may be as closely related to *S. chipolana* as to *S. smithii* Dall.

Occurrence: A. L. Parrish farm, Washington County, Florida.

Psamosolen aff. *P. sancti-dominica* Maury

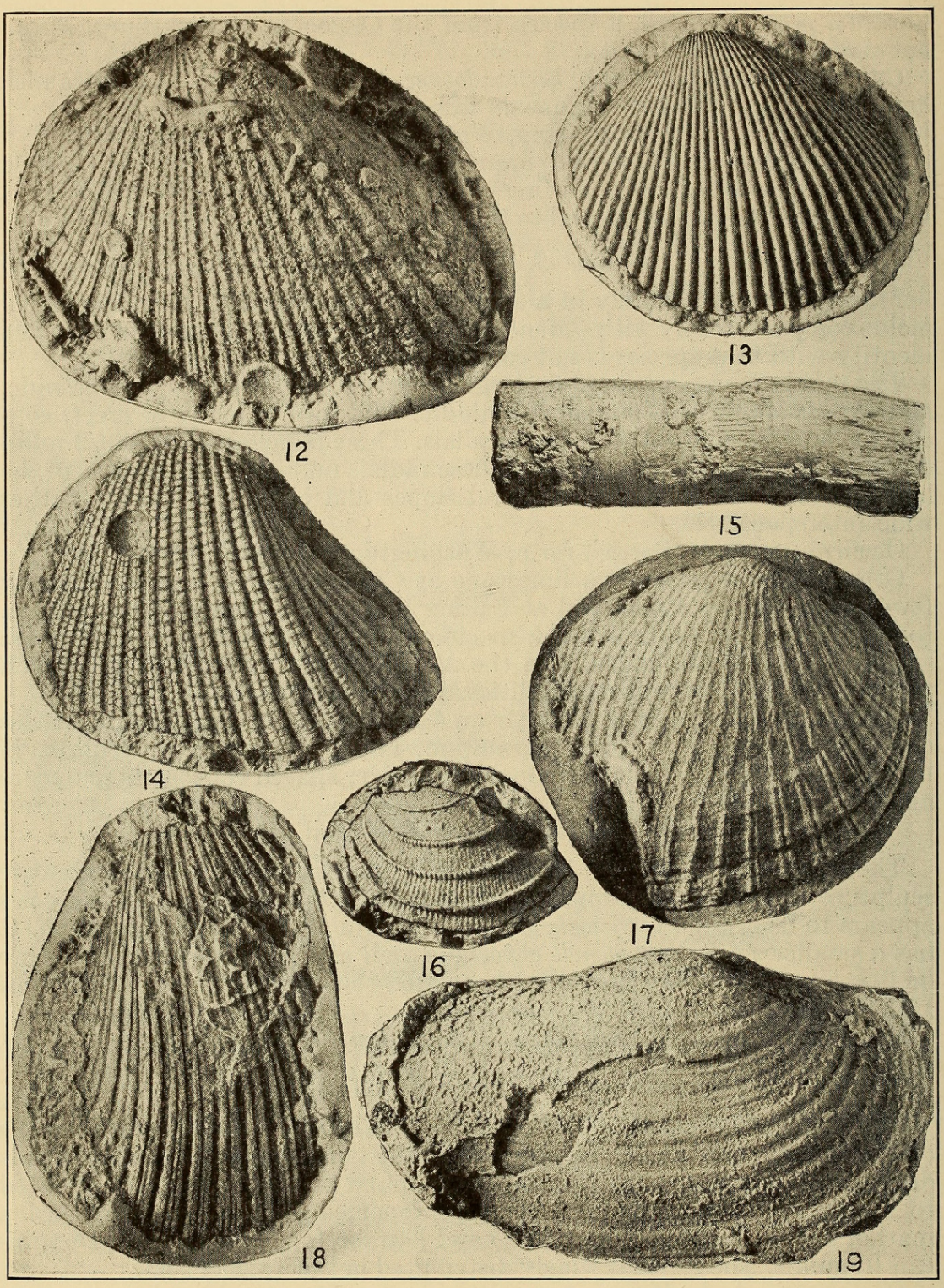
The material consists of an external mold showing about half of the original shell. The exact relationship of this specimen to other species is difficult to determine with the material in hand but it appears to be related to *P. sancti-dominica* Maury, a species reported to occur in the Bowden marl of Jamaica and in the Cercado and Gurabo formations of the Dominican Republic. The genus is widely distributed in the warmer seas.

Occurrence: A. L. Parrish farm, Washington County, Florida.

Spisula? sp.

The material consists of an external mold of part of the original shell. This specimen probably is a *Mactra* or *Spisula*. Not knowing the genus the relationship to other forms cannot at present be determined.

Occurrence: A. L. Parrish farm, Washington County, Florida.



Figs. 12, 17, 18.—*Anadara macneili* Mansfield. 12, squeeze of holotype, ×3; 17, squeeze of paratype, ×3. U. S. Nat. Mus. No. 497650; 18, squeeze of paratype, ×3. U. S. Nat. Mus. No. 497649. Fig. 13.—*Cardium* (*Trachycardium*) aff. *C. hernandoense* Mansfield. Squeeze, ×3. U. S. Nat. Mus. No. 497653. Fig. 14.—*Andara mummi* Mansfield. Squeeze of holotype, ×3. Fig. 15.—*Teredo*? *incrassata* Gabb, ×1. U. S. Nat. Mus. No. 497657. Fig. 16.—*Chione* cf. *C. spenceri* Cooke. Squeeze, ×4. U. S. Nat. Mus. No. 497655. Fig. 19.—*Panope* cf. *P. parawhitfieldi* Gardner, ×2. U. S. Nat. Mus. No. 497656.

Panope cf. *P. parawhitfieldi* Gardner Fig. 19

The material consists of an internal mold of both valves. This specimen measures: Length, about 40 mm; altitude, about 25 mm. The umbo is rather low and is situated about 18 mm from the anterior end. So far as can be determined this specimen most closely resembles *P. parawhitfieldi* Gardner, a species occurring in the Oak Grove sands of Florida; however, an adult specimen of the same species might show differences.

Occurrence: A. L. Parrish farm, Washington County, Florida.

Teredo? *incrassata* Gabb Fig. 15

The material consists of fairly good sized tubes and a few fragments. These tubes occur abundantly in the Suwannee limestone (upper Oligocene) but have not been found in the Tampa limestone (lower Miocene). They occur in the Cercado formation and other horizons in Santo Domingo not definitely placed stratigraphically.

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BOTANY.—*A new species of* Callirhoë.[1] ROBERT F. MARTIN, Bureau of Plant Industry. (Communicated by S. F. BLAKE.)

Nuttalia pedata Nutt. ex Hook. was described in 1827 and transferred by Gray in 1849 when he resurrected the genus *Callirhoë* of Nuttall. Although in later years Gray realized that the original *Nuttallia pedata* was synonymous with *Callirhoë digitata* Nutt., he did not see fit to publish a new name, and *Callirhoë pedata* has continued to be used to designate the common annual poppy mallow of Texas and Oklahoma. That *Nuttallia pedata* is the same plant as *Callirhoë digitata* is shown by the original figure and by a sheet in the Gray Herbarium collected by Hooker in the Glasgow Garden. This sheet is annotated, "An original of *N. pedata*." Furthermore, according to Carruthers in a letter to Gray, all of Nuttall's specimens of *N. pedata* sent to the British Museum had large perennial roots. It

[1] Received December 29, 1937.