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**NOTES ON AMERICAN CRETACEOUS FOSSILS, WITH DESCRIPTIONS OF
SOME NEW SPECIES.**

BY W. M. GABB.

After fifteen years, during which I have been engaged constantly at other geological and palæontological labors, but have not lost sight of my first love—the Cretaceous fossils of the Atlantic region of the United States—I have spent much of the past summer in reinvestigating them. In this work I have been materially assisted by the constantly enriching collection of the Academy, and have received a large suite of fossils from Dr. Little, the State Geologist of Georgia. Besides these, Prof. Cook, of New Jersey, has loaned me all of the specimens from his survey collection that I required, so that I have it in my power, while describing a number of new forms, to correct many of my own juvenile errors, as well as similar ones of others, which must result during the publication of a large number of small, isolated papers. Many of the fossils of New Jersey are only known as internal casts in the marls, and, while very unsatisfactory, require names, if only provisional ones, to assist the field geologist in the identification of strata. Some of these have from time to time been rediscovered in the gray marl, commonly known as the “Ripley group,” and we may reasonably hope that all will eventually be fully described. This Ripley marl is a deposit now known to extend from New Jersey around through the coast States to Tennessee. It has been found in all of these States except Delaware, Maryland, Virginia, and South Carolina, that is to say, it seems coextensive with the Atlantic Cretaceous. It is a fine-grained, gray material, in which, unlike most of the rest of the formation, the shell substance is preserved, and, although the shells are often distorted, their specific as well as generic characters are beautifully preserved. It is especially favorable for the study of the bivalves, since, in nearly all cases, the hinges can be exposed. The fossils are extremely fragile, alike from the softness of the inclosing material and from the fact that the animal matter seems to have totally disappeared, without being replaced by any other cementing substance. Still, with care, the greater part of the fossils can be extracted and afterwards hardened with gum,

so as to fit them for study and preservation. In the following paper I have enumerated all the recognizable species sent me by Dr. Little, since very little is known of the fossils of Georgia, and in that sense this is a geographical list:—

NAUTILUS, Linn.

N. Bryani, n. s.

Shell discoidal, sides flattened, nearly parallel; dorsum regularly rounded; umbilicus small; aperture elongate, emarginate to about a third of its length by the preceding whorl; siphuncle central, small; septa slightly arched forwards, close to the umbilicus, and very gently backwards on the middle of the side of the whorl. Surface unknown.

Greatest diameter 3.5 inches; width of aperture 1.9 inch; height of mouth from umbilical margin 2 inches, from the dorsum of included whorl 1.4 inch.

From the yellow Cretaceous limestone of Vincenttown, New Jersey. Two fragments, one comprising half of a volution, well preserved, showing seven septa; the other, a smaller fragment of a larger specimen, useful only as confirming the specific determination.

This species is markedly distinct from *N. Dekayi*, the only other described species in New Jersey. Its flattened sides are entirely unlike the globose form of that species. It seems nearest to *N. Sowerbianus*, D'Orb., resembling that species in the size of its umbilicus and in the style of the septa, as well as in being compressed. But our species differs in having the sides more parallel, in the whorls increasing somewhat less rapidly in size, and in the septa being further apart and less sinuated throughout. I take great pleasure in dedicating it to my friend, Colonel T. M. Bryan, who has, by his assiduous collecting, added much to our knowledge of the New Jersey fossils.

N. sp. indet.

I have also received from Col. Bryan another form from the dark marls of New Jersey, near Vincenttown. This is distinct from either of the known species, having very sinuous septa. It is represented by fragments too imperfect for description.

N. Dekayi, Morton.

Synopsis Cret. p. 33, pl. 8, f. 4; pl. 13, f. 4.

A distorted specimen from Pataula Creek, Georgia, from Dr. Little.

N. elegans, Sby.

It is not improbable that the shell referred by me (in the Report of the Palæontology of California, vol. 1, p. 59, pl. 9, fig. 3) to *N. Texanus*, Shumard, may prove to be Sowerby's species. It seems to agree quite closely, not only in its outline and proportions, but in the shape of the septa and in the ornamentation. The only difference I can detect is that, in the Californian shell, the ribs are a trifle larger and less numerous—a very unreliable character in these shells. Dr. Shumard's species, only known to us by a description from imperfect specimens, may also have to be put down as a synonym.

AMMONITES, Brug.

A. placenta, Dekay.

Ann. N. York Lyc. vol. 2, pl. 5, f. 2.

A large specimen from Pataula Creek, Georgia.

A. Trinitensis, Gabb.

A. Gibbonianus, Marcon, Geol. N. A. p. 35, pl. 2, fig. 2; *not id.*, Lea, Trans. Amer. Philos. Soc., 2 ser. vol. 7, p. 254, pl. 8, f. 3.

In my paper on the fossils of South America, now going through press (Journ. Acad. 1876), I have pointed out the differences between the Texan fossil and that from South America, and I now propose the above name. Marcon found his specimen on one of the tributaries of the Trinity River, Texas.

HAMITES, Park.

H. ? torquatus, Morton.

Syn. p. 45, pl. 15, fig. 4.

A straight fragment, with the *Ammonites placenta*, some three inches long. I have it also in my collection from Uniontown, Ala., showing part of the septum.

FUSUS, Lam.

EXILIFUSUS. New subgenus.

Shell very long, slender, fusiform, spire high; aperture produced into a long, slender, twisted canal.

This group differs from the true genus *Fusus*, as restricted, by its twisted, slender canal. In this character it approaches some of the *Neptunæ*, but its high spire and strongly costate whorls show that it is more nearly allied to the true *Fusus*. *Exilia* of Conrad (Journ. Philada. Acad., 2 ser., vol. 4, p. 291) has a

“beak perfectly straight,” and may be only an extremely slender *Fusus*. The author does not describe the shape of the outer lip, and gives us no clue as to its family relations, whether it belongs with the *Fusinae* or the *Pleurotomidæ*. The lines of growth on my shell are slightly sinuous on the upper part of the body whorl, though not enough to be called the notch or sinus of a *Surcula*, the genus which it most resembles in that family. I attribute their shape to the generally curved outline of all of the body whorl.

The figure of *Fusus Diaboli*, Pal. Cal. v. 1, pl. 18, fig. 35, is a very accurate reproduction of one specimen before me, the extremity of the canal being broken away. But I have another, nearly of the same size, with the same character of the spire, in which the aperture and canal are larger than the spire, the canal being twisted exactly as in the present described species. In the specimen figured, as above, the lines of growth are slightly sinuous also, so that further research may prove that this is really a member of the *Pleurotomidæ*.

F. (E.) Kerri, n. s. Pl. 17, f. 1.

Shell elongate, slender; spire high; whorls about six or seven, rounded on the sides and bordered on the upper margin by a rib adjoining the suture. Surface marked by about a dozen oblique heavy ribs, beginning on the top of the whorl adjoining the marginal thickening, most prominent on the upper angle of the whorl, and disappearing a little below the middle. In addition to these characters, their entire surface is covered by numerous closely placed, fine, revolving ribs. Upper part of the aperture sub-elliptical, continued below into the twisted canal, twice as long as the upper portion. Columella thickened and marked by a comparatively prominent angle, similar to that of *Busycon*, where the curved canal begins.

Length 1.25 inch; width 0.37 inch.

A single specimen in the Museum of the Academy, from the Cretaceous of North Carolina (Ripley group). Named in honor of Prof. W. C. Kerr, State Geologist of North Carolina.

SURCULA, H. and A. Ad.

S. strigosa, n. s.

Shell very long and slender; spire and aperture of nearly equal length; whorls broadly rounded, perhaps eight in number (apices

broken), those of the spire marked by a peculiar revolving constriction just above the suture. Surface cancellated by numerous, small, longitudinal ribs, somewhat smaller than their interspaces, and crossed by still smaller revolving lines. These latter continue over the whole surface to the end of the canal.

Length 3 inches; width 0.6 inch.

From a light-colored Cretaceous marl from Holmdale, N. J., from the collection of the N. J. Geological Survey, kindly loaned to me by Prof. Cook.

This is the most slender species of the genus with which I am acquainted. The shell substance is entirely destroyed, but the surface characters are preserved, all except the lines of growth. I am consequently unable to describe the shape of the outer lip. The groove above the suture causes an appearance, at first sight, as if the top of the whorls was bordered by a thickening; but the separation of the volutions is still marked by a slight fissure in the suture, which is placed about a tenth of an inch below the groove. This seems to have died out on the body whorl.

S. (*Surculites*) *Mathewsonii*, Gabb.

Fusus, *id.*, G., Pal. Cal. v. 1, p. 83, pl. 18, f. 33.

S. (*Surculites*) *io.*, Gabb.

? *Fasciolaria*, *id.*, G., Pal. Cal. v. 1, p. 101, pl. 28, f. 214.

Both of these species, as seen from better specimens than I had originally, have the broad, shallow sinus on the upper part of the whorl, characteristic of *Surcula*. The first certainly belongs to Mr. Conrad's subgenus; the latter, however, with its tuberculated volutions, may have to be separated, though there is no named division into which to remove it. Generically, or subgenerically, they only differ in this character.

DRILLIA, Gray.

D. *Georgiana*, n. s.

Shell elongate, fusiform; spire elevated, longer than the mouth; whorls seven or eight, flattened, bordered by a thickened rim adjoining the suture; below this is a groove followed by a series of heavy longitudinal ribs, about 12 or 13 to a volution. These ribs are not well defined beyond the middle of the body whorl. Crossing the entire surface are numerous revolving lines, appearing as small ribs on the upper whorls, and as narrow impressed grooves on the last whorl. Notch narrow and shallow (as determined

from lines of growth), and corresponding to the groove below the thickened upper margin of the shell. Canal moderately long; details of it and of the mouth unknown.

Length 1.5 inch; width 0.4 inch.

From the Ripley group, Pataula Creek, Clay Co., Georgia; Dr. Little.

A pretty species, resembling *Turris Ripleyana*, Con. (Journ. Acad., 2 s., v. 3, pl. 35, f. 21), in ornament, but more slender, with a higher spire and shorter body whorl.

TRITONIUM, Linck.

Subgenus LAGENA, H. and A. Ad.

T. (L.?) edentatum, n. s.

Shell thin, short, broadly subfusiform; spire moderately elevated; whorls seven; spire turretted; whorls of spire sub-angulated and sloping above, terminated in a thickened, beaded margin adjoining the suture, and constricted below this margin; body whorl regularly rounded. Upper whorls marked by numerous longitudinal ribs, sometimes visible on the upper part of the body whorl, sometimes obsolete. These are crossed by revolving lines, always distinct on the spire and on the anterior part of the body whorl, but sometimes obsolete on the middle. Aperture broad, subelliptical; canal short, very slightly recurved. Outer lip simple; inner lip lightly encrusted. No tooth on the posterior part of the inner lip.

Length 1.4 inch; width 1 inch.

A smooth, rounded shell, with ornamented spire, rather plain body volution, and no varices. With the following species, to which it is closely allied, it seems to form a distinct group in the Tritons, nearest, however, to *Lagena*, to which I have referred it, but differing in the absence of the tooth.

Common on Pataula Creek, Georgia; Dr. Little.

T. (L.?) interruptum, Con. (sp.).

Chemnitzia, *id.*, Con., Journ. Acad., 2 ser., v. 3, p. 333, pl. 35, f. 15.

With the preceding. Mr. Conrad describes the species as having the "spire prominent;" but my specimen, as well as his figure, shows that it is not so long as the mouth.

Chemnitzia? gloriosa, Roem. Kried. von Texas, p. 40, pl. 4. f. 3. From the remarkable resemblance in the style of ornament

of this shell to the two preceding, I have little doubt that it is subgenerically identical with them. Roemer's fanciful restoration of the anterior end of the mouth, of course, goes for nothing.

NASSA, Lam.

N. globosa, n. s.

Shell thin, subglobose; spire moderately elevated; whorls six or seven, the upper whorls costate, the ribs not reaching to the suture; above the ends of the ribs is a narrow concave space; suture bordered by a slight thickening of the margin of the succeeding volution; suture not impressed, although well marked—partly obliterated by irregular lines of growth. Body whorl not ribbed, but ornamented by small indistinct and sometimes almost obsolete revolving lines. Aperture oblique; outer lip simple; inner lip rather heavily encrusted by a narrow deposit, and terminating in front in a heavy rib, hardly visible externally; anterior notch narrow and deep.

Dimensions of a small specimen: length 1.0 inch; width 0.9 inch. Other specimens, too imperfect for measurement, indicate a size nearly twice that given.

From the Ripley group of North Carolina, Museum of the Academy, from Prof. Kerr, and from the same deposit on Pataula Creek, Georgia, from Dr. Little.

FASCIOLARIA, Lam.

F. Slackii, Gabb.

Proc. Acad. 1861, p. 323.

Described from a single internal cast from New Jersey. The longitudinal ribs are large, showing strongly on the cast. The revolving sculpture, if it existed, is unknown. From the shape and from the cast of the columellar fold it most probably belongs to Meek's subgenus *Piestochilus*.

Subgenus CRYPTORHYTIS, Meek.

F. (C.) crassicosta, n. s.

Shell small, broadly fusiform; spire moderately elevated, number of volutions unknown, suture well marked and undulated; body whorl subangulated, flattened above, convex in the middle, and rapidly constricted in advance. Surface bearing about nine large rounded longitudinal ribs, beginning near the suture, strongly developed on the upper angle and disappearing with

the convexity in advance; the entire surface to the end of the canal, is crossed by small but well-defined revolving elevated lines, showing a slight tendency to alternation in size. Aperture broad above, constricted into a moderately short twisted canal; inner lip encrusted terminating in advance in a single heavy oblique fold.

Length about 1.0 inch; width about .65 inch.

A single specimen from Pataula Creek, Georgia; Dr. Little.

It is somewhat distorted in shape by pressure, and has lost part of its apex; but its heavy ribs and strongly twisted columella will distinguish it.

F. (C.) Kerri, n. s.

Shell small, subfusiform, spire shorter than the aperture, whorls five, suture minutely channelled; upper whorls sloping convexly; body whorl regularly convex and gradually contracted in advance into a moderately long and somewhat curved canal; surface marked by a few large square revolving ribs, five on the convex part of the body whorl, and numerous smaller ones in advance; these are crossed by faint longitudinal ribs, more closely placed than the first. At the points of crossing, these two sets of ribs develop well-marked little nodes or tubercles. On the spire, the longitudinal ornaments do not appear, but each volution carries three revolving ribs, the upper of which is smallest. Aperture gradually narrowed in front; inner lip somewhat encrusted and bearing a small oblique fold on the angle.

Length .75 inch; width .4 inch.

From the Ripley of N. Carolina; Prof. Kerr.

F. (C.) obliquicostata, n. s.

Shell small, fusiform, spire not quite as long as the aperture; whorls about five or six, upper surface rounded, subtruncated; body whorl widest above, top sloping, tapering in front. Surface marked by a few large oblique ribs with broad concave interspaces; these ribs begin at the suture, are most prominent on the angle of the whorl and disappear in front. The entire surface is also crossed by numerous fine revolving striae. Aperture gradually narrowing in advance; inner lip sinuous, encrusted; fold small, very oblique; canal moderately twisted.

Length .9 inch; width .45 inch.

Locality; with the preceding.

From *F. (C.) crassicosta*, this shell differs in its much more slender form, its higher spire, less twisted canal, and in the longitudinal folds being much more compressed laterally and placed obliquely instead of direct.

PYROPSIS, Con.

P. Richardsonii, Tuomey, sp.

Pyruia. id., Tuomey, Proc. Acad. 1855, p. 169.

Perissolar? id., Gabb, Syn. Cret. p. 69.¹

Tudicla (Pyropsis) perlata, Con., J. Acad. 2 s., v. 4, p. 288, pl. 46, f. 39.

This species is found in New Jersey, and is abundant in the white limestone of Prairie Bluff, Ala. Dr. Little has sent me one internal cast from Pataula Creek, showing that it grows to a diameter of nearly two inches.

P. Bairdi, M. & H. (sp.) Meek.

Pyruia Bairdi, M. & H.

With the additional information furnished by Mr. Meek's illustrations, especially by the wood-cut, p. 371 of his admirable memoir, I am convinced that there is no generic, or even subgeneric difference between his species, and that of Mr. Conrad's type, lying before me; unless it may be found in the end of the canal of the Eastern species, and which has never yet been found. *P. Richardsonii* has a slender canal, probably not umbilicated, but this is not ground enough for a separation. The characters of the inner lips of the two species are identical.

P. elevata, Gabb.

Rapa. id., Gabb, Journ. Acad. 2 s., v. 4, p. 301, pl. 48, f. 12.

Tudicla, id., Gabb, Syn. Cret. 1861, p. 85, *id.* Meek, Check List Cret. No. 750.

Described from the brown sandy marl of Burlington Co., N. J.

But a single internal cast has ever been found and this corresponds so nearly in size and shape with *P. Bairdi*, that I suspect it of being identical. It is certainly not the same as *P. Richardsonii (perlata Con.)*, as Mr. Conrad intimated in Journ. Conch., 1868, p. 248.

¹ This arose from an error, I having confounded Tuomey's two species, and transposed them in their genera. I intended to put this under *Tudicla*, and to put *trochiformis*, which is a round bodied shell, under *Perissolar*. Even this, however, would have been wrong, since, as will be seen below, on obtaining more material I am obliged to separate it.

? *P. trochiformis*, Tuomey (sp.).

Pyrrula, *id.*, Tuomey, Proc. Acad. Nat. Science, 1855, p. 169.

Tudicla, *id.*, Gabb, Syn. Cret., p. 85.

Shell moderately large, spire somewhat elevated; body whorl convex on the sides, sloping above, canal long and straight; surface marked by prominent acute revolving ribs, about nine on the body whorl and others pretty regularly placed, to the end of the canal; between these are concave interspaces, and those on the body whorl are, in some specimens, crossed by faint longitudinal ribs. The inner lip is encrusted, and, just where the mouth contracts into the canal, bears a prominent bend like that in some of the *Fasciolarias*, but without folds; or better, resembling somewhat *Busycon*.

Length 3.75 inches; width 2.0 inches.

A fossil, common as casts in New Jersey, and in the white limestones of Alabama. The above description is from a specimen in the Museum of Yale College, from Uniontown, Ala. It is the only one showing the entire surface, that I have ever seen, and also the only one retaining its entire canal.

I have long had doubts as to the generic relations of this shell, and have referred it provisionally to *Pyropsis*, since that is the nearest clearly defined genus. The columella of my specimen is not perfect enough to warrant me in asserting that the inner lip may not be like that of *Pyropsis*, though I think, as described above, it is more like that of *Busycon*. Should this eventually prove to be the case, the species, with probably both the following, must be separated as a distinct genus, for which the name *Trochifusus* would not be inappropriate.

P. septemlirata, Gabb.

Cancellaria, *id.*, Gabb, Proc. Acad. 1860, p. 94, pl. 2, f. 10.

A shell closely allied to the preceding, and also marked by revolving sculpture, but differing in having a much lower spire, less globose body whorl, tapering into the canal much more regularly in front. The species was described from internal casts, from the New Jersey marls, and in no case has the canal been preserved. Enough, however, has been obtained to show the peculiar curve of the columellar margin.

P. Alabamensis, Gabb.

Cancellaria, *id.*, Gabb, Journ. Acad., 2 s., v. 4, p. 301, pl. 48, f. 14.

Also described from an internal cast, showing slight traces of longitudinal ribs. Another, smaller specimen, from Mississippi,

also a cast, shows that the surface had both longitudinal and revolving ornaments. There were about 12 or 13 longitudinal ribs, crossed by eight or ten smaller, revolving ribs. This also shows part of a long, straight canal. The longitudinal ribs and the high spire separate this from all other species yet known in the genus. I also have it, but in a very imperfect state, from New Jersey (Vincenttown, Col. Bryan).

VOLUTIDÆ, Fleming.

Almost every author who has written on this family has suggested a different grouping of the genera, and no two fully agree in regard to the range of the genera themselves. Among the more modern writers, H. and A. Adams proposed three subfamilies: *Cymbiinæ*, *Zidoninæ*, and *Volutinæ*. Under the first, they place the genera *Cymbium*, *Melo*, with the subgenus *Ausoba*, and *Aulica*. In *Zidoninæ*, the genus *Zidonia* = *Volutella*; and in the last subfamily, genera *Callipara*, *Cymbiola*, *Scaphella*, with subgenus *Alcithæ*, *Voluta*, *Harpula*, *Fulgoraria*, with subgenera *Aurinia*, *Lyria*, with subgenera *Enæta* and *Volutilithes*. In the appendix to their work these authors change the arrangement, as follows:—

Subfamily VOLUTINÆ.

Genera CYMBIUM.

MELO.

SCAPHA.

Subgenera *Aurinia* (*Livonia*, Gray).

Aulica.

Cymbiola.

Alcithæ.

VOLUTA.

Chlorosina.

Harpula.

FULGORARIA.

LYRIA.

Harpella.

Enæta.

VOLUTILITHES.

CALLIPARA.

ZIDONA.

Ausoba (*Nobilia*, Gray).

Ericusa (*Scaphella*, G., not Sw.).

Subfamily SCAPHELLINÆ.

Genus SCAPHELLA (*Amoria*, Gray).

They also adopt Dr. Gray's subfamily *Volutimitrinæ* for the genus *Volutimitra*.

Dr. Gray, in the Guide to Systematic Distribution of Mollusca in the British Museum (1857), proposed a somewhat different arrangement, as follows:—

a. VOLUTINA.

†YETINA.

- Genera 1. YETUS.
 2. CYMBIUM.
 3. SCAPHA.
 4. FULGORARIA.
 5. CALLIPARA.
 6. VOLUTA.
 7. LYRIA.

Subgenera *Lyria*.
Enæta.

8. VOLUTELLA.

‡AMORIANA.

9. AMORIA.

b. VOLUTIMITRINÆ.

10. VOLUTIMITRA.

And finally the subfamily PORCELLANINA, made up of *Porcellana* (= *Marginella*), *Closia* (= *Volutella*, Sw.), and *Persicula*. This latter group must be thrown out.

In 1873, Dr. Theodore Gill proposed an arrangement of the Families of Mollusca, in which he separates the family into two groups:—

- a. *Volutimitrinæ* = { *Volutimitrina*, Gray.
 { *Amoriana*, Gray.
 b. *Volutinæ* = { *Volutina*, Gray.
 { *Yetina*, Gray.

This division, as I have been personally informed by the author, is based on the dentition; a character not always the most reliable, though in this case it seems to be sustained by the others.

Reversing the position of the groups, as placed by Dr. Gill, it seems to me that the following genera include all of the known species, and are sufficiently clearly circumscribed :—

Subfamily VOLUTINÆ.

CYMBIUM, Klein, Auct.

Yetus, Adams, Gray.

MELO, Humph.

Type *Voluta melo*.

SCAPHA, Gray (not Humph. nor Klein).

Subgenus *Aurinia*, H. and A. Ad.

Type *S. dubia*.

AULICA, Gray.

Ausoba, H. and A. Ad.

Type *V. aulica*.

VOLUTELLA, D'Orb. 1839.

Zidona, H. and A. Ad.

Type *V. angulata*.

H. and A. Adams have renamed this genus because the name *Volutella* was preoccupied both by Perry and Swainson. But since neither of their names stand, D'Orbigny's, being the oldest, must, and *Zidona* becomes a synonym.

CALLIPARA, Gray, 1847.

Type *C. bullata*.

CYMBIOLA, Sw. 1853.

Type *C. ancilla*.

ALCITHÆ, H. and A. Ad. 1853.

Type *V. fulgetrum*.

VOLUTA, Linn.

Harpula, Sw.

Type *V. musica*.

Although *V. vexillum*, Swainson's typical species, looks sufficiently unlike *V. musica* to have warranted a separation, it only requires a study of a large series of specimens, of the few species in this group, to satisfy one that the division has not even a sub-generic value. *V. musica* alone varies through half a dozen spe-

cific names, some of the extreme forms almost as round as *veillum*. I have fossil specimens from the Pliocene of Costa Rica, almost exactly the shape of *V. veillum*, without a tubercle on the angle of the whorl, and marked with as many folds on the inner lip as a *Cypræa*.¹

FULGORARIA, Schum. 1817.

Fulguraria, H. and A. Ad.

Type *F. rupestris*, Gm.

VOLUTODERMA, Gabb. New genus.

Shape similar to *Fulguraria*, which it also resembles more or less in surface sculpture; apex not papillate; inner lip marked by from three to five well-marked folds, not very oblique, and of pretty uniform size. This is a group of shells characteristic of the cretaceous rocks, and, perhaps, peculiar to them. They are all somewhat slender, and are marked by longitudinal ribs, not always well defined, and by revolving ribs; the columella is always straight or nearly so, and the folds are as isolated and distinct as those of *Turbinella*. But the most strongly distinguishing character is the entire absence of the irregularly rounded mass at the apex of the shell, one of the best characters of *Fulguraria*. The species have been referred to *Voluta*, *Volutilithes*, *Fulguraria*, and even *Fasciolaria*. *V. Navarroensis*, Shum., Gabb, Paleontology of California, vol. i., pl. 19, f. 6, may be taken as the type. The genus includes such species as—

V. elongata, d'Orb. sp.

Voluta, *id.*, d'Orb., Pal. Fr. Cret., v. 2, p. 323, pl. 220, f. 3.

Volutilithes, *id.*, Stol., Sitz. Akad. Wien., lii. p. 74.

Fulguraria, *id.*, Stol., Pal. Ind., p. 87, pl. 7, f. 1-9.

Voluta Trichinopolitensis, Fbs., Tr. Geol. Soc. Lond. v. 7, p. 133, pl. 15, f. 5.

This shell is very variable in height, and carries three equal columellar folds. Specimens before me, sent to me by Dr. Stoliczka, from Trichinopoly, show that the apex is as acute as in my Californian shell.

Another shell, accompanying this, marked *Fasciolaria rigida*, Stol., *bi. cit.*, p. 109, pl. 10, f. 10-16 (*Voluta rigida*, Baily), evi-

¹ For further remarks on this subject see Crosse, Journal de Conchyliologie, vol. 19, p. 271.

dently also belongs to this genus, as well as do *Fasc. carinata*, Stol., and *F. assimilis*, Stol.

AURINIA, H. and A. Ad. 1853.

Type *A. dubia*.

VOLUTOMORPHA, Gabb. New genus.

Shell elongate, fusiform; whorls cancellated by longitudinal and revolving ribs. Columella with one very oblique fold, and sometimes one or more smaller secondary folds. In shape this genus is not unlike the two preceding genera, but it differs from them all in having essentially a single large oblique fold. When more than one occurs, the secondary folds are smaller than the large primary.

Type *Volutilithes Conradi*, Gabb, Journal Acad. Nat. Sciences, 2 s., v. 4, pl. 48, f. 10.

V. CRETACEA, Con., *loc. cit.*, pl. 47, f. 18, also belongs to this genus, and *V. Delawarensis*, Gabb, Proc. Acad. 1861, p. 322.

ROSTELLITES, Con. 1855.

Type *R. Texana*, Con., Emory's Report, Mexican Boundary Survey, p. 158, pl. 14, f. 2.

A curious genus, the most slender of the Volutes, with numerous equal plaits on the columella, and with the outer lip somewhat expanded anteriorly.

VOLUTIFUSUS, Con. 1866.

Type *V. typus*, Con., J. Conch., 1866, p. 67, pl. 3, f. 2.

Very characteristic of the Mioocene.

LYRIA, Gray, 1847.

Type *L. Delessertii*.

ENÆTA, H. and A. Adams, 1853.

Types *L. Cummingii*, *harpa*, etc.

Marked by a tooth in the middle of the outer lip, seems to be but a division of *Lyria*.

VOLUTILITHES, Swains, 1831.

Type *V. abyssicola*.

A genus abundant in the Eocene rocks, perhaps found in the Cretaceous, and represented in the living fauna by but a single species.

ATHLETA, Con., 1853.

Types *A. rarispina* and *A. Tuomeyi*, Con., J. Acad., 2 s. v. 4, pl. 47, f. 35.

A form separated by Conrad from *Volutilithes* on account of a heavy callosity deposited on the spire above the aperture.

LEIODERMA, Conrad, 1865, Proc. Acad., 1865, p. 184.

Type *L. leioderma*, Con., J. Acad., 2 s. v. 4, p. 292, pl. 46, f. 32.

Includes also *Volutilithes cretacea*, Con., *loc. cit.*, v. 3, p. 333, pl. 35, f. 16.

Subfamily SCAPHELLINÆ, H. and A. Ad.

Volutimitrinæ, Gill; *Volutimitrina* and *Amoriana*, Gray.

SCAPHELLA, Swains., 1832.

Amoria, Gray.

Type *S. Junonia*.

VOLUTIFUSUS, Con., 1866.

Type *V. typus*, Con., J. Conch., 1866, p. 67, pl. 3, f. 2.

Very characteristic of the Miocene, but does not include *V. Junonia*, as Mr. Conrad intimates.

VOLUTIMITRA, Gray.

Types *V. Grœnlandica*.

In addition to the above, there are perhaps several other genera among the fossil Volutes. *V. rarispina*, Lam., with which I am only acquainted by published figures, may be an *Athleta*, or it may be new. It certainly cannot be placed in any other genus.

The two shells, *Athleta purpuriformis* and *A. scrobiculata*, of Stoliczka, were referred to that genus from a misconception on the part of the author. They have not the characteristic callous, are subglobular, instead of being subfusiform and angulated, and the folds are very oblique, and on the anterior part of the columella. The genus might be called *PTYCHORIS*.

Ficulopsis Stoliczka, Pal. Indica, p. 84, founded on *Pyrrula Pondicherriensis*, Forbes, is a *Ficus*, with folds on the columella. I have just received from the Cretaceous of Georgia an allied form, with a flattened columella and with a single fold. I cannot agree with the Doctor in placing it in the *Volutidæ*.

Megastypna, Con., founded on a *Miocene* species, described by me under the name of *Foliate sinuosa*, differs only from *Foliatifusus* in having the folds unusually heavy. Together with Mr. Conrad, I have compared it with several species of the latter genus, and find that some of the species, especially *F. mutabilis*, Con., vary so in this character, that we have agreed that the distinction is not a valid one. *F. mutabilis* varies not only in the presence and absence of folds, but also in their direction when present, and in the shape of the anterior half of the shell. Some specimens are perfectly straight in advance, while others are as twisted as the typical form of *F. Anomia*. In fact I am by no means convinced that *Foliatifusus* should be separated from *Scaphella*.

LEPTONEREA, Con.

L. unia, Con. sp.

Conrad, *Ill. Con.*, *J. Acad.*, 1 s. v. 2, p. 332, pl. 35, f. 22.

Fossilites unia, Con., *J. Acad.*, 1 s. v. 2, p. 332, pl. 35, f. 24.

Common at Patuxent Creek, Chy Co., Ga. A long, slender, fusiform shell, with a polished surface, high spire, with the upper whorls faintly ribbed longitudinally. The outer lip is slightly thickened at its junction with the body whorls, and obliquely truncated in advance. The columella bears a single faint very oblique fold. Its surface, although polished, shows strong lines of growth. Mr. Conrad agrees with me in the above synonymy.

I have a cast, apparently of the same species, from Crosswicks, New Jersey.

VILVIBEREA, Galt.

V. biplicata, Galt.

Fossilites biplicata, Galt, *Journ. Acad.*, 1 s. v. 4, p. 290, pl. 48, f. 4.

Estellites biplicatus, Nees, *Con. Check List*, No. 699.

But a single specimen of this species has ever been found. It shows none of the surface, but its form is so peculiar that it cannot be mistaken. Its two folds are in such a position that I have little hesitation in referring it to this genus.

V. sp. indet.

Another form occurs in the brown marls of Vinzantown, N. J., of which two internal casts have been found by Col. T. M. Bryan. In size and general shape it approaches *Foliatomorpha Conradi*, but has three strong transverse folds on the middle of the columella. From impressions on the inner face of the cast of the outer

whorl its surface is covered by small longitudinal ribs, crossed by numerous revolving lines, the characteristic sculpture of the genus.

VOUCOMORPHA, Gabb.

V. Courtil, Gabb.

Volutidites *id.*, Gabb, Journ. Acad., 3 s. v. 4, p. 300, pl. 48, f. 10.

Estellites *id.*, Meek, Cretaceous Check List, No. 491.

The typical species of the genus. A common fossil in New Jersey. I have not seen it yet from other parts of our Cretaceous deposits. It is a long, slender, fusiform shell, a little variable in shape, but always slightly subangulated on the upper part of the whorl; the middle is gently convex, with the sides converging in advance. The canal is straight, and the columella bears one large oblique fold. Sometimes one or two smaller secondary folds occur. The surface is marked by numerous longitudinal ribs crossed by more closely placed revolving ribs. Impressions of this surface in the matrix, and on the inner face of the cast of the body whorl are not rare, but I had never seen even a piece of shell preserved until a few days ago, when Col. Bryan brought me a body whorl with a third of its surface covered with well-preserved shell.

V. Abbotti, Gabb.

Volutidites *id.*, G., Proc. Acad. Nat. Sci. 1860, p. 94, pl. 2, f. 7.

The surface of this shell is as yet unknown. The columella, besides the large typical fold, carries also three smaller and more transverse ones above.

V. Saffordii, Gabb.

Volutidites *id.*, Gabb, Journ. Acad., 3 s., v. 4, p. 300, pl. 48, f. 8.

A strongly cancellated species, approaching the preceding in form.

V. bella, Gabb.

Volutidites *id.*, Gabb, Journ. Acad., 3 s., v. 4, p. 300, pl. 48, f. 7.

Estellites *id.*, Meek, Check List Cret. No. 489.

A remarkably symmetrical fusiform shell, not very rare in New Jersey. Its surface is unknown.

V. Kzevi, Gabb.

Voluta *id.*, Gabb, Proc. Acad. 1861, p. 322.

V. macronata, Gabb.

Voluta *id.*, G., loc. cit. p. 322.

ROSTELLITES, CON.

R. nasutus, Gabb, sp., Meek, Check List, No. 692.

Volutilithes id., G., Journ. Acad., 2 s., v. 4, p. 300, pl. 48, f. 9.

This shell has normally three folds on the columella, but I have seen specimens with five or six. It is the most slender of all the *Volutilidæ* of New Jersey, and can be distinguished, even in casts, by the entire absence of longitudinal ribs or plications. Prof. Geo. Cook, State Geologist of New Jersey, who has loaned me all the desirable specimens of the survey collection, has at last obtained this shell, showing the surface. Unlike most of the marl fossils, these specimens, of which there are several, are fossilized, so that, while all shell structure is destroyed, being replaced by marl, the surface characters are perfectly preserved. The species is characterized by about 17 or 18 elevated, thin, revolving ribs, those in advance placed very obliquely; the interspaces are three or four times as wide as the ribs. All the specimens are more or less distorted, but enough remains to show that the outer lip was broadly expanded, and, perhaps, even very slightly everted in advance.

From Pataula Creek, Clay Co., Georgia, Dr. Little has sent me some imperfect internal casts which seem to belong to this species, but which are unusually large. Better material may prove them to belong to a distinct species.

PTYCHOSYCA, N. gen.

Shell like *Ficus* in shape; surface smooth (or sculptured?); inner lip bearing one very oblique fold on the anterior part of the columella.

This shell fills in a gap in the series of genera, and connects Stoliczka's genus *Ficulopsis* with the true *Ficus*. *Ficulopsis* has the same general style of sculpture as *Ficus*, but bears several plaits on the columella, so like some of the *Volutes* that Dr. Stoliczka united it with them in the same family. The present genus has a fold, but it is small and very oblique. The posterior notch, which the author mentions as doubtfully a generic character in his species, seems, from a study of ours, to be so. In *Ficus*, the outer lip shows a very slight trace of it; in our genus it is more marked, while in the Indian fossil it develops into a regular *Pleurotomoid sinus*.

P. inornata, n. s., pl. 17, f. 2, 3, 4.

Shell small, regularly convex; spire small; number of whorls unknown (apex destroyed on the only specimen); suture nearly obsolete; surface without other marks than faint lines of growth; body whorl convex above, tapering in advance, slightly constricted by a broad, shallow, revolving groove in advance; canal short, notched in advance; outer lip very slightly notched posteriorly, immediately adjoining the suture; inner lip thinly encrusted and bearing one very oblique fold.

Length about 1.5; width about .75. The specimen is compressed, so that, with the loss of the tip of the canal, the measurements can be only approximate. The lines of growth, which are distinct, enabled me to ascertain the details of the anterior end.

A single specimen from the Ripley group, Pataula Creek, Georgia; Dr. Little.

GYRODES, Con.

G. abyssinis, Morton (sp.).

Natica id., Morton, Syn. Cret. p. 49, pl. 13, f. 13.

Gyrodes id., Gabb, Syn. Moll. Cret. p. 59.

Described originally from Prairie Bluff, Ala. We did not know the surface of this shell, until now I have received from Dr. Little specimens from the Ripley group, from Pataula Creek, Georgia. The surface is perfectly plain, slightly flattened adjoining the suture, and with the umbilical margin rounded. It is marked only by lines of growth, and has none of the crenation of the upper edge, characteristic of Conrad's species *G. crenata*. It also occurs, though rare, in New Jersey.

G. petrosa, Morton, (sp.).

Natica id., Morton, Syn. Cret. p. 48, pl. 19, f. 6.

Gyrodes id., Conrad, Journ. Acad., 2 s., v. 4, p. 289.

G. alveata, Con., loc. cit. p. 289, pl. 46, f. 45.

Originally described from internal casts from Prairie Bluff, Ala. Mr. Conrad's species, from the Ripley group of Mississippi, was described from shells retaining their surface. They are identical, and we have the same species from Glassboro, N. J., from Colonel Bryan, and from Mullica Hill, whence it was brought by Mr. John Ford.

AMAUROPSIS, Mörch.

A. paludinæformis, H. and M. (sp.).

Natica id., H. and M., Mem. Am. Acad., Boston, v. 5, p. 389, pl. 3, f. 3.

A. id., M. and H., Proc. Phil. Acad. 1860, 185.

In the Academy's museum are half a dozen specimens of this species, brought by Mr. Conrad from Haddonfield, N. J.

LUNATIA, Lam.

L. rectilabrum, Con.

There is yet some confusion about this species. Mr. Conrad described it as a *Natica* in the Journal Phil. Acad. 2 ser. vol. 4, p. 344, pl. 35, f. 28. In my synopsis of Cretaceous Mollusca, I placed it as a synonym of Hall and Meek's *concinna*. In Hayden's report, Mr. Meek refers it to H. and M.'s *obliquata*, and separates *concinna* and *obliquata* on the ground that the latter has an opercular groove, wanting in the former. This hardly seems to me to be a valid specific difference, and I believe the synonymy should stand as follows:—

L. obliquata, H. and M. (sp.), Meek, Cret. Check List, No. 672.

Natica id., H. and M., Mem. Bost. Acad., v. 5, p. 389, pl. 3, f. 1.

N. concinna, H. and M., *loc. cit.*, p. 389, pl. 3, f. 2.

N. moreaucnsis, M. and H., Proc. Acad., 1856, pp. 64, 282.

Lunatia concinna, Meek, Hayden's Rep., p. 314.

N. rectilabrum, Con., J. Acad., 2 s. v. 4, p. 344, pl. 35, f. 28.

N. acutispira, Shum., Trans. St. Louis Acad., 1860, p. 597.

It is common everywhere in the Ripley Group, and Dr. Little now sends it from Pataula Creek. The altitude of the spire, and the obliquity of the body whorl differ considerably in the eastern shell, as is frequently the case with *Naticas*, and, consequently, if there is no difference except the presence or absence of a groove, and a slight one at that, made by the operculum on the pillar lip, the difference is too slight to divide them. *N. acutispira* of Shumard, of which I compared a specimen, some years ago, with the Atlantic form, also comes into this synonymy.

SCALA (Klein), Humph. 1797.

Scalaria, Lam., 1801.

S. (Opalia) Thomasi, n. s.

Shell slender, thin, subulate, whorls numerous, increasing gradually in size, rounded, and curving abruptly to the suture; surface

marked by numerous, small, very thin plates, and crossed by well marked though small revolving lines, base bordered by an angular carina. From the white limestone of New Jersey, a single specimen given me by Prof. W. H. B. Thomas. Its nearest ally, *S. (O.) Sillimani*, Morton, from Prairie Bluff, Ala., is a somewhat larger shell, with a wider apical angle, the varices, instead of being numerous thin plates, are fewer and thickened, and the revolving sculpture is much finer. From *S. annulata*, Morton, found with it in New Jersey, it can be at once distinguished by its much narrower apical angle, very much smaller size, and in the ornaments. In that species, in the adult stage, the ribs become rounded on their edges; in the young shells they are squamose, though not so numerous, and the revolving sculpture is fine and closely placed. From the following species it can be known by the plates being smaller and thinner, by the revolving sculpture, which in this is marked, while in that it is either very fine or wanting. Further, in this species, the carina at the base of the whorls is merely a strongly marked angle, over which the longitudinal markings cross without change; the plates very regularly decreasing in prominence from the sides to the base of the whorls, and reaching the lip as mere threads. In that species the carina is a strong rib, and the longitudinal plates continue well elevated and thick to the end. I have not described the mouth, because in the only specimen it is in great part broken away. From a trace in the umbilical region, it seems to have been bordered by the usual thickened lip.

S. (O.) cyclostoma, n. s.

Shell smaller and slightly more slender than the preceding; whorls seven, cross sections circular; surface marked by numerous prominent recurved ribs, one of which on each whorl is thickened, showing a periodical arrest in growth; between these ribs is very minute revolving sculpture, a little more distinct on the earlier whorls. Aperture circular, bordered by a very thick expanded lip; base of body whorl bordered by a strong rib.

Length .55 inch, width .25 inch.

In the large varices this is not unlike *S. Sillimani*, but it is distinguished by its smaller size, narrower whorls, less thickened longitudinal ribs, and by the base. In that species the base is much flatter, the revolving carina is less evident, and each rib, on

the angle is reflexed back into a little lip or notch; these ribs also become much less distinct on the base.

S. (O.) annulata, Morton.

Scalaria, id., Morton, Synopsis, p. 47, pl. 3, f. 10.

A character exists in this shell which has never been mentioned. It has a broad open umbilicus, bordered by an angle, as well marked as that of *Architectonica*, though, of course, not so large.

I have yet another species from Georgetown, Georgia, from Dr. Little, nearest to *S. annulata* in the character of its ribs, but apparently more like *S. Sillimani*, in the shape of the shell. It consists of only one whorl and a part of another imbedded in a hard rock and too imperfect for description.

PUGNELLUS, Con.

Dr. Little has sent me from the Ripley marl of Pataula Creek, Clay Co., Georgia, specimens of Conrad's original *Strombus densatus*, Journ. Acad., 2 ser. vol. 3, p. 330, pl. 34, f. 6, which have enabled me to discover that it is a very different shell from that which the same author called *Pugnellus densatus*, in the 4th volume of the same work, p. 284, pl. 46, fig. 31. It is more than twice as large as adults of the latter species, the canal is straight, and the outer lip is not so thickened. The first species, that from the 3d volume, must retain the specific name, and that in the 4th volume must be renamed. I, therefore, name it *P. typicus*, since that species was the one for which the genus was first founded. More perfect material than I yet possess may even prove that *P. densatus* may belong to my subgenus *Gymnarus*.

ANCHURA, Con.

A. arenarum, Morton, sp.

Rostellaria, id., Morton, Syn. Cret., p. 48, pl. 5, f. 8.

R. arcuarium, d'Orb., Prod. Pal., v. 2, p. 227.

Chemnitzia distans, Con., Journ. Acad., 2 s. v. 3, p. 333, pl. 35, f. 30.

With the preceding, from Dr. Little.

A. Texana, Roem., sp.

Scalaria, id., Roem., Kreid von Texas, p. 39, pl. 4, f. 11 a-b.

Chemnitzia, id., Meek, Check List, No. 658.

“ “ Gabb, Pal. Cal., vol. 2, p. 261.

Aporrhais, id., Stoliczka, Pal. India, vol. 2, p. 231.

Stoliczka says he examined, in the museum in Bonn, the original of *Scalaria Texana*, “and found that it was based upon an imper-

fect specimen of an *Aporrhais*." On re-examining my own specimen of the species I see nothing incompatible with its belonging to the genus *Anchura*, a view which is sustained by Roemer's figure, and doubtless Dr. Stoliczka found some remains of the expanded lip, or of the terminal ascending suture line. He did not understand the genus *Anchura*, restricting it to those species in which the outer lip bears two points, one posterior, the other running parallel with the canal. As I have shown elsewhere the genus cannot be so restricted, and there are not even valid grounds for retaining Meek's *Drepanochilus* as a subgeneric division. Stoliczka called two species of *Anchura* by the name of *Aporrhais*, and, therefore, I am satisfied that he meant this same group. The long, slender spire of the species in question is very like many species of *Anchura*, but is wholly incompatible with *Aporrhais*.

APORRH AIS, Dillw.

?*A. bicarinata*, n. s.

Shell small, spire elevated, number of volutions unknown; upper whorls bearing an angle in the middle, from which the surface slopes inward to the suture; below this angle it slopes very slightly outwards to the sutures below; body whorl bearing two angles on the middle, the upper slightly the largest; outer lip unknown, inner lip lightly encrusted, expanded, and slightly reflected, producing a groove which runs from the posterior angle of the aperture, parallel with the mouth, down to the canal.

Width of body whorl, less the expanded lip, about 0.5 inch. This species is described from two fragments from Pataula Creek, Georgia, sent me by Dr. Little. They are so mutilated that I do not know the outer lip, the canal, nor the upper whorls of the spire. In fact, nothing remains except the body volution and the one adjoining it. Both show the very remarkable character of the inner lip, so that I am convinced it is not an accidental result of crushing. The form of the body whorl is very similar to the little shell described by Mr. Meek, from the Yellowstone region, under the name of *Aporrhais biangulata*. It has the same two carinæ, and, like that shell, is smooth, unlike it, not showing, under a magnifying glass, any trace of sculpture. The most marked difference exists in size, our species being larger than Meek's magnified figure (Hayden's Report, pl. 19, fig. 6 *b*). Another difference occurs in the spire. In that all of the upper whorls are rounded,

in this the upper carina of the body whorl is continued on the middle of the upper whorls, the suture following the lower carina. The peculiar character of the inner lip is not mentioned in Mr. Meek's description, as it certainly would had it been present. As to the generic relations of the present species, it may belong to *Aporrhais*, and I have so referred it on account of its close specific relation to the Northwestern species, or it may prove to be an *Anchura*. In this group the generic determination cannot be certain until we have all of the parts of the perfect adult shell, the classification resting almost entirely on the manner in which the adult forms its mouth.

TURBINOPSIS, Con.

This genus seems to be not remote from *Trichotropis*, resembling the subgenus *Iphine* in form, but differing in having a thick shell, and in bearing a rather obscure fold on the inner lip close to the anterior end. This fold is not visible externally, but can be seen if the outer lip is broken away or on casts.

T. Hilgardi, Con., Journ. Acad., 2d ser., vol. 4, p. 259, pl. 46, fig. 29.

Cancellaria, id., Gabb, Syn. Cret. Moll., p. 42.

T. depressus, Gabb, Proc. Acad., 1861, p. 321.

Found in New Jersey, Delaware, Alabama, and Mississippi. My name given to casts from New Jersey must stand as a synonym.

GYROTROPIS. New genus.

Shell thin, resembling *Trichotropis* in form, spire elevated; umbilicus open like in *Iphine* and *Turbinopsis*; surface biangulated like in the typical form of *Trichotropis*, but covered also with numerous very thin foliated varices like *Murex*.

A peculiar genus, combining a series of characters which ally it closely to *Trichotropis*, but markedly different in the presence of thin plates covering the surface, and expanded to an unusual degree.

G. squamosus, n. s., pl. 17, fig. 5.

Shell moderate in size, turbinate; spire about as high as the length of the mouth, whorls eight, apex acute, body whorl bicarinate, the carina high and very thin; outline sinuous in front to the umbilical margin, concave between the carinae and above the upper one to the suture; upper carina carried on the middle of

all the upper whorls to the apex; suture channelled, the channel formed by the upper surface of the lower carina, the succeeding whorl being soldered to the outer edge of the plate-like ridge; umbilicus open, narrow, deep, bordered by the sharp, acute angle of the base of the volution; surface ornamented by numerous very thin, squamose, murex-like varices, most marked on the anterior part of the shell, these are all crossed by closely placed revolving lines, somewhat alternated in size. Aperture broad, outer lip thin, inner lip rather heavily encrusted.

Length, 1.1 inch; width, 0.9 inch.

From Snow Hill, North Carolina, from the Ripley marl. Collection of the Academy.

TURRITELLA, Lam.

T. encrinoides, Morton, Synopsis, p. 47, pl. 3, fig. 7.

Pataula Creek, Georgia, Dr. Little.

LAXISPIRA. New genus.

Shell spiral, dextral, whorls with a circular cross section, few in number, and so rapidly descending as to form an open spiral; aperture simple, lips thin.

A curious genus, the relations of which are not clear to me. I propose it to receive some shells which have been long known as internal casts in the marls of New Jersey, but of which the surface was unknown until quite recently. In general form they might be compared to a partially uncoiled *Turritella*. From that genus they differ, however, in the whorls not being in contact, and from *Vermetus* and the allied genera in being regular spirals, but not having the apex either turritelloid or attached. Another analogy, though perhaps only one of external resemblance, might be adduced in such shells as *Euomphalus circinalis*, Goldf., or in some of the Delphinulas.

L. lumbricalis, n. s., pl. 17, f. 6, 7.

Shell with a circular cross section, whorls about as far apart as the diameter of the whorls, three or four in number; surface marked by numerous small, closely placed revolving ribs.

This description is from a small specimen from the Ripley marl from Haddonfield, N. J., presented to the Academy by Mr. Conrad. Casts over two inches long and about half an inch in diam-

eter of aperture are common in the glauconite marl, and apparently belong to the same species.

BIVONIA, Gray.

?*B. cretacea*, n. s.

Shell tubular, irregularly coiled in the young stage; curved, straight, or irregular as it grows older; surface irregularly wrinkled by lines of growth; aperture circular, substance thick.

Average diameter of shell .25 inch to .3 inch.

I propose this name for a shell consisting of a contorted tube common in the Ripley marls, and which shows so few characters that it is hard to describe it. I have never seen any signs of attachment, and no two specimens are of the same shape. Dr. Little has sent me a good series from Pataula Creek, Georgia.

ENDOPTYGMA. New genus.

E. umbilicata, Toumey (sp.), pl. 17, f. 8, 9.

Phorus umbilicatus, Toumey, Proc. Acad., 1855, p. 169.

This shell was described by Tuomey from internal casts well known in the Cretaceous of Mississippi and Alabama. It differs from the typical *Phorus*, Montf. (*Xenophora*, Fisch.) in having a strong revolving plate inside, nearly midway between the umbilical and outer margin on the base, leaving a groove on the cast. The irregularly pitted upper surface shows that the shell agglutinated foreign bodies to its surface in the same manner as in the genus from which I propose to separate it. Figure 8 shows the position of the internal plate, as represented by a groove on the cast; figure 9, a side view of a smaller specimen.

ATAPHRUS, Gabb.

Palæontology of California, vol. 2, p. 171.

Additional material has enabled me to become better acquainted with this genus, and obliges me to modify a little the generic description. The inner lip is rounded above, on the body whorl, and merges insensibly into the adjoining surface, covering up the umbilicus; but, instead of being round all of the way down, as described, it ends abruptly just at, or a very little in advance of, the umbilicus, in a little tubercle, on the outer or front face of the pillar, below which the lip is slightly grooved. The position I

assigned it, associated with *Oxystele* and *Photinula*, is correct, it differing from the former in having the tubercle and the anterior groove, instead of being flattened; and in wanting the angular termination of the latter.

The figure of *A. crassus* is incorrect, in that it makes the pillar lip round all of the way down.

A. compactus, Gabb.

Littorina, *id.*, G., Pal. Cal., v. 1, p. 131, pl. 20, f. 89.

This is a member of the genus, but the figure and description are incorrect in the one character of the inner lip. Better specimens than the original (which, like that of *A. crassus*, were slightly weathered) show that the groove should only have been represented as extending half way up the inner lip, the upper half being regularly rounded and terminating in the tubercle mentioned. The anterior end of the mouth also is rounder than the figure.

In addition to the above, I have another species from the cretaceous of North Carolina. This shell, from the character of its fossilization gives us another character, the pearly structure; an additional proof of its family affinities, and one which was not attainable in its Californian congeners.

A. Kerri, n. s. Pl. 17, f. 10.

Shell small, turbinate; spire slightly elevated, whorls five, convex above and below, and obscurely angulated in the middle; suture well marked, following the angle in all the upper whorls, but in the adult shell, for the last fourth of a volution, descending at a slightly increased angle. Entire surface covered by small closely placed revolving ribs with acute interspaces. Aperture circular, outer lip retreating very obliquely from the suture and then regularly curving downwards on the middle of the upper half of the whorl; edge acute. Inner lip covering all of the minute umbilicus and then truncated abruptly, a little in advance, as described above.

Height 0.15 inch; diameter 0.21 inch.

A beautiful little shell, closely allied to *A. compactus*, but differing in being less elevated, in the subangulated whorls, in the more rapidly descending suture, near the mouth, and in the sculpture. In *compactus* the sculpture is a series of rather strong, though small revolving ribs. In *A. Kerri* the ribs are so close together, and the interspaces so small that in one case they be-

came nearly obsolete. In another, however, they are stronger, approaching the Californian shell. *A. crassus* differs from this species in the entire absence of revolving sculpture and of angulation, and in its more sloping top.

TURNUS, Gabb.

Subgenus *Xylophagella*, Meek.

T. (X.) *contortus*, Gabb.

Teredo contorta, G., Proc. Acad., 1861, p. 323.

A study of the valve of this species shows it to be an allied species to *T. (X.) elegantula*, but more oblique, and differing in sculpture.

MARTESIA, Leach.

M. *cretacea*, Gabb.

Pholas, id., Gabb, J. Acad., 2 s. v. 4, p. 393, pl. 68, f. 18 (tube). *Id.*, G. Proc. Acad., 1861, p. 324 (shell).

Rare in the marls of New Jersey. The tubes are occasionally found perforating wood, but replaced by pyrites. I have before me an excellently preserved shell with both valves in contact, and which shows clearly the generic characters.

M. *cithara*, Mort. sp.

Pholas, id., Morton. Syn. Cret., p. 68, pl. 9, f. 2.

P. pectorosa, Con., J. Acad., 2 s. v. 2, p. 293, pl. 24, f. 9.

Equally rare with the preceding. I have never seen but the two respective types.

LEPTOSOLEN, Con.

L. *biplicata*, Con., J. Conch., v. 3, p. 15.

Siliquaria, id., Con., J. Acad., 2 s. v. 3, p. 324, pl. 34, f. 17.

Not rare on Pataula Creek, Clay Co., Georgia, Dr. Little.

LEGUMEN, Con.

L. *planulatus*, Con. (sp.).

Solemya, id., Con., J. Acad., 2 s. v. 2, p. 274, pl. 24, f. 11.

Legumen, id., Gabb, Syn. Cret., 1861, p. 133.

L. elliptica, Con., Journ. Acad., 2 s. v. 3, p. 325, pl. 34, f. 19.

L. appressu, Con., *loc. cit.*, p. 325.

A fine shell growing three inches long; several specimens from Pataula Creek, Georgia. It is one of the most widely diffused species in the Ripley marl. On comparing the various types of the above names, I find that the names have been given to dif-

ferent ages of the same shell. The lines of growth at the same age in all the forms have the same direction.

PERIPLOMYA, Con.

Leptomya, Con., Nat. Ad.

Plicomya, Stol.

P. elliptica, Gabb.

Anatina, *id.*, Gabb, Proc. Acad., 1861, p. 324.

I place this shell under the above generic name, in accordance with the opinion of Mr. Conrad, who has examined seven original specimens, and recognized its generic relations. It is an extremely rare shell.

SOLYMA, Con.

Not *Solemya* (as in index).

S. lineolatus, Con., Journ. Conch., vol. 6, p. 75, pl. 3, f. 9.

Mr. Conrad has identified for me, under the above name, a little shell out of the Georgia collection of Dr. Little, from Pataula Creek. It is a little more than half as wide as long, the beak is median, the two ends are very nearly equal, and the base is very slightly convex. Although mine is a left valve, I am unable to describe this part of the hinge, since, in cleaning away the marl, the teeth were destroyed. These fossils are so fragile that, until after being hardened by gum, a breath will almost destroy them. Mr. Conrad, who cleaned this hinge, saw the teeth just at the moment of their destruction.

PHOLADOMYA, Sby.

P. Littlei, n. s.

Shell very large, gibbous, beaks large, prominent, nearly in contact, placed about a third of the length from the anterior end. Base irregularly convex, most prominent a little behind the middle, from which it slopes up with a broad gentle curve to the anterior end; posterior end broader than the anterior and gaping. Surface marked by about a dozen large acute ribs, with broad concave interspaces. The anterior end is not costate, or very faintly so; the first well-marked rib descends directly from the front part of the umbone directly to the base, curving slightly forward at its lower end. The strongest ribs are on the middle of the shell, and they are somewhat more widely placed, and become more oblique posteriorly.

Length 6 inches, width from beak to base 4 inches, diameter of both valves 3 inches.

This is the finest species of the genus with which I am acquainted, and I dedicate it with pleasure to Dr. Little, State Geologist of Georgia, who sent me three well-preserved specimens, one retaining the greater part of its surface, from Pataula Creek, Clay County. It can be at once recognized by its few large ribs, increasing rather than diminishing in size posteriorly, and in being less oblique than *P. occidentalis*, Morton, the only other large species known in America. It is twice the linear size of that shell.

CYMBOPHORA, Gabb.

C. lintea, Con. sp.

Cardium (Protocardia) linteum, Con., J. Acad., 2 s., v. 4, p. 278, pl. 46, f. 17.

Veleda, *id.*, Con., Journ. Conch. 1871, p. 74.

Veleda, *id.*, Con., Kerr's Geol. Rep. N. Car., p. 9, pl. 1, fig. 26.

Dr. Little sent me a good suite of this species, and on uncovering the hinge, I cannot find any valid difference between it and my typical form, on which to base a generic separation, unless it be on a peculiar cross striation of the lateral teeth, which I did not observe in the Californian shells. The species attains a large size. One specimen measures: length 4 inches, width 3 inches, depth of single valve 1 inch. In its young state it is thin, but becomes quite thick as it grows older. I have ventured to associate these large specimens with Mr. Conrad's species, although in all of them the hinges are destroyed; but I can find no good grounds either in form or surface markings for separating them. My smaller specimens on which I identified the species are an inch and a half long.

SCHIZODESMA, Gray.

? *S. appressa*, n. s.

Shell small, subtriangular, flattened, thin; beaks sub-central, a little in advance of the middle; anterior end rounded; posterior end produced, subtruncated, cardinal margins sloping rather rapidly from the beaks; base broadly convex; a distinct umbonal ridge runs from the beaks to the posterior basal angle; and one less marked runs nearly parallel with the posterior cardinal margin to the upper angle of the truncated posterior end. Surface marked only by lines of growth. The hinge agrees better with

the above genus than with any other described; in the left valve the V-shaped tooth is delicate, though well marked, and encroaches slightly on the deep ligament pit; the lateral teeth are very small, short, and thin. The species can be at once distinguished from the preceding by its shape.

Length 1.2 inch; width 0.9 inch.

A rare species, from Pataula Creek, Georgia; Dr. Little.

TENEA, Con.

T. *pinguis*, Con. (sp.)

Lucina, *id.*, Con., Journ. Acad., 2 ser., vol. 2, p. 275, pl. 24, fig. 18.

Diplodonta parilis, Con., *loc. cit.*, vol. 4, p. 278, pl. 46, f. 16 (not 8 as in text).

Mysia gibbosa, Gabb, *loc. cit.*, vol. 4, p. 302, pl. 48, f. 17 (not f. 18 as in text).

Tenea parilis, Con., Journ. Conch., v. 6, p. 73, pl. 3, f. 12, *id.*, Con., Kerr's Geol. Rep. N. Car., p. 8, pl. 2, f. 25.

Mr. Conrad and I redescribed this species simultaneously in the 4th volume of the Academy's Journal, both of us overlooking the fact that it had been previously described as a *Lucina* and with a bad illustration. It does not possess the angular base given to it in vol. 2.

TELLINA, Linn.

Tellinella, Gray.

T. (T.) *Georgiana*, n. s.

Shell moderately large, elongate; beaks central, elevated, anterior end produced, rounded; base very slightly convex; posterior end subangulated below, arched above; a strong umbonal ridge runs from the beaks to the angle. Surface destroyed on the only specimen I have seen.

Length 2.6 inches; width 1.25 inch.

The impression of the hinge is preserved in the matrix, and the shell is so strongly characterized by its form that I have not hesitated to describe it. It is from Pataula Creek, Georgia, in a hard calcareous marl.

GARI, Schum.

G. *elliptica*, n. s.

Shell moderately large, very thin, subelliptical in outline; beaks central, somewhat elevated; anterior end prominent above the middle, retreating below with a gentle curve to the base;

posterior end rounded, broader than the anterior; base most prominent a little in advance of the beaks. Surface marked by irregular lines of growth. Ligamental groove strongly marked; hinge consisting of two teeth in the right valve and one bifid tooth in the left.

Length 2.4 inches; width 1.5 inch.

This shell resembles in size and general shape *G. texta*, Gabb, of the Californian cretaceous, but is not so narrowed anteriorly; is less obliquely truncated posteriorly, and the beaks are more elevated; it also differs in the surface.

From the Ripley marl, Pataula Creek, Georgia.

PERONÆODERMA, Poli.

P. Georgiana, n. s.

Shell small, thin, flattened; elongate, beaks subcentral; in one case in the middle, in another a little posterior; cardinal margins sloping about equally towards both ends. Anterior end prominently and narrowly rounded; posterior rounded, subtruncate; base broadly and regularly convex. Surface marked by fine, regular concentric lines. Hinge composed of minute teeth.

Length 1.2 inch; width 0.8 inch.

Intermediate in form and size between *T. Hoffmani* and *T. longa* of the Californian cretaceous and differing from both in having the posterior cardinal margin convex, instead of concave. In this character and in the rounded base, it differs also from *Eneplana*, Conrad, of the N. Carolina Cretaceous. Two specimens from Pataula Creek, Georgia; Dr. Little.

CYPRIMERIA, Con.

C. depressa, Con., Kerr's Rep. Geol. N. C., p. 9, Palæontology.

Dosinia depressa, Con., J. Acad., 2 s., v. 4, p. 278, pl. 46, f. 6.

Sanguinolaria cretacea, Con., *loc. cit.*, p. 277, pl. 46, f. 11.

C. Cretacensis, Con., J. Conch., 1867, p. 9.

C. cretacea, Con., J. Conch., 1869, p. 98, not *C. cretacea* (Dosinia)

Zittel, Con., J. Conch., 1866, p. 102.

Dosinia Haddonfieldensis, Lea, Proc. Acad. 1861, p. 149.

Georgia specimens, from Doctor Little, differ only from those from Alabama in being nearly twice the size.

C. torta, n. s.

Shell large, discoidal, inequivalve, the right valve more convex than the left; beaks in advance of the middle; anterior end and

base regularly rounded; posterior narrowed, truncated and strongly deflected to the left side, more so below than above. Surface unknown.

An internal cast from Georgetown, Ga., from Dr. Little, measuring: length 3.0 inches, width 2.5 inches, internal diameter of valves 1.0 inch.

From *C. densata*, Con., the present species can be at once distinguished by its being shorter and in having the posterior cardinal margin nearly straight. From *C. excavata*, Morton (sp.), by being more quadrate and longer. From *C. Texana*, Roem. (sp.), in being narrower and more produced behind. I have casts from Texas of another species approaching this, certainly a different species, but too close to describe without more material than mere internal casts.

CARDIUM, Linn.

Subgenus *Pachycardium*, Con.

Stoliczka does not approve of Conrad's genus *Pachycardium*, and is inclined to associate it with *Pseudocardia*. The type *P. Spillmani*, if it does not stand as a separate genus, should rather be placed with *Lævicardium* than with *Protocardia*, since it has no ribs on the posterior face and only half a dozen obsolete radiating lines on the umbonal angle. It is clearly not a *Lævicardium*, from which it is separated by its very thick shell structure, its elongate form, and by the irregular transverse corrugations following the lines of growth. Most if not all of the *Lævicardia* are thin, delicate shells with polished surfaces. Whether the East Indian *bisectum* belongs to this genus or not, *C. Spillmani* should, in my opinion, be taken as the type of a separate genus, or subgenus.

Casts are not rare in a sandstone at Georgetown, Georgia. They show that the hinge teeth were enormously developed, especially the laterals; the muscular scars are very deep and, in advance of the posterior muscle, there is a thickening of the shell, broad and rounded and occupying the position of the plate of *Cucullæa*. The posterior portion of the internal margin is crenulated, but more closely than the part corresponding to the ribs on the umbonal ridge. The species is also found as casts in the brown and black marls of New Jersey, and associated with them I have a cast, more globose than any of the specimens that can be

referred to Conrad's species. It is of the same size, shows traces of the same surface markings, but is broader, rounder, and has the beaks much nearer and more incurved than the internal moulds of either the other Jersey specimens, or those of Mr. Conrad from Mississippi.

Subgenus *Trachycardium*, Mörch.

C. (T.) *Carolinense*, Con., Kerr's Rep. Geol. N. C. Palæont., p. 7, pl. 2, f. 1.

A larger shell than *C. Eufaulense*, Con., more circular in outline and less angulated on the umbonal ridge. It is very closely related, however, and requires care and good specimens to distinguish it.

Not rare at Pataula Creek, Georgia; Dr. Little.

C. (T.) *Eufaulense*, Con.

Cardium (*T.*) *id.*, Con., Journ. Acad., 2 s. vol. 4, p. 282, pl. 46, f. 12.

A single valve from Quitman Co., Georgia; Dr. Little. This shell is common in North Carolina.

C. (T.) *Alabamense*, Gabb.

Cardium multiradiatum, Gabb, Journ. Acad., 2 s., vol. 4, p. 395, pl. 68, f. 29; *not id.*, Sby., Darwin's Geol. Obs. S. A., p. 251, pl. 2, f. 16.

All three of these shells differ from the typical form of *Trachycardium* in having smooth ribs, in which character they approach *Cerastoderma*, with which probably they might better be associated.

GRANOCARDIUM, Gabb.

C. (G.) *Tippanum*, Con.

Cardium, *id.*, Con., J. Acad., 2 s., vol. 3, p. 326, pl. 34, f. 8 b.

Granocardium, *id.*, Gabb, Pal. Cal., vol. 2, p. 266.

Casts of this species are not rare in a hard brownish sandstone at Pataula Creek, Georgia.

CRASSATELLA, Lam.

C. *pteropsis*, Con., J. Acad., 2 s., vol. 4, p. 279, pl. 46, f. 5.

A rare shell at Pataula Creek, Georgia, though very common in North Carolina.

C. *vadosa*, Morton, Syn., p. 66, pl. 13, f. 12.

C. Ripleyana, Con., J. Acad., 2 s., vol. 3, p. 327, pl. 35, f. 3.

C. linteæ, Con, *loc. cit.*, vol. 4, p. 279, pl. 46, f. 5.

C. Ripleyana of Conrad is the typical form of the species, previously described by Morton; convex on its posterior cardinal margin in the young state and straight or slightly concave below

towards the posterior angle. *C. lintea* is a shell of the same species, having attained but half its full diameter. I am not sure but that *C. Carolinensis*, Con. (Kerr's N. Carolina Report, Palæontological Appendix, p. 6), should also be put down as a synonym. I only know it from the figure in the report, but the shape is very close to *lintea*, and the identity of this, I have proven by a critical comparison of the original specimens.

C. sp. indet.

A cast in brown sandstone, sent by Dr. Little from Pataula Creek, Georgia. The impression of the hinge is perfectly preserved, as well as most of the outline. It is two and a half inches long by two wide and rather flat. The posterior cardinal line is slightly arched throughout, and the posterior end broadly rounded. I do not think it belongs to any described species, but refrain from naming it until better material is found.

ANTHONYA, Gabb.

Scambula, Con.

Anthonya, G., Palæontology of Cal. 1864, p. 181, pl. 30, f. 236, a.

Scambula, Con., Journ. Conch., 1869, p. 48, pl. 9, f. 7-8.

On comparing my types of *A. cultriformis*, with those of Mr. Conrad's *S. perplana*, it proves that they are generically identical, the hinges agreeing perfectly. There is only one difference, and that of minor importance; my shell, which is very long, is slightly twisted, while Mr. Conrad's, which is much shorter, is all on one plane.

OPIS, Dep. ?

O. Conradi, Gabb,

Isocardia, *id.*, G., Journ. Acad., 2 ser., vol. 4, p. 393, pl. 68, f. 21.

LITHOPHAGA, Bolt.

Lithodomus, Cuv., *Lithophagus*, Muhlfl.

L. Ripleyana, Gabb, Proc. Acad., 1861, p. 326.

L. affinis, G., *loc. cit.*, p. 327.

Arcoperna Carolinensis, Con., Kerr's N. C. Rep., Pal., p. 5, pl. 1, f. 6.

I named *L. affinis*, a form shorter, more convex, and a little curved, but I do not now believe that even a greater difference in form in a boring shell can be made the basis of a specific distinction, unless repeated in a very large suite of specimens. Mr. Con-

rad's name must be placed as a synonym; his figure agrees exactly with specimens of my species, which is not rare. I have before me a large series, some showing the valves perfectly preserved, and others bedded partially and entirely in fossil wood.

INOCERAMUS, Sby.

I. *Tippanus*, Con. (sp.).

Pholadomya Tippana, Con., J. A., 2 s., v. 3, p. 324, pl. 34, f. 9.

I. costellatus, Con., *loc. cit.*, p. 329, pl. 34, f. 12.

A rare shell; very thin and marked by both radiating and concentric sculpture. It is very inequivalve, as will be seen by the figure 12 above quoted.

TRIGONIA, Brug.

T. *Leana*, Gabb.

Trigonia Gibboniana, G., Pal. Cal., vol. 1, p. 190, pl. 17, f. 178; pl. 31, f. 262, not *T. Gibboniana*, Lea, Trans. Amer. P. Soc., 2 s., v. 7, p. 255, pl. 9, f. 7, 9.

From the rather poor figure and imperfect description of Mr. Lea, quoted above, I made a doubtful identification of the Californian shell with the South American. Recently, while studying some fossils from Peru, Mr. Lea kindly placed his types at my disposal, and, among other errors I have been enabled to correct, is this one. Our two species are of the same type, but they differ very materially in the ornamentation. I have therefore renamed the Californian species.

T. thoracica, Morton, Synopsis, p. 65, pl. 15, f. 13.

From the Ripley of Pataula Creek, Georgia; Dr. Little.

T. *angulicosta*, n. s.

Shell small, elongate, curved; anterior end regularly convex; base broadly rounded in the middle, slightly concave posteriorly; posterior cardinal line concave; posterior end prolonged, truncate. Surface divided by a ridge, separating the corselet from the broader part; corselet crossed by transverse ribs, corresponding in number to those below; towards the end these are directed obliquely backwards. Outer surface divided into three parts; nearest the beaks it is marked on the anterior half of the adult shell by about ten or a dozen prominent ribs, most of which, after traversing half the distance from the corselet to the base, suddenly bend forward at a slightly acute angle, and terminate at the anterior

margin of the shell; posterior to these are about ten more ribs, which traverse the entire width, from the corselet to the base. On the anterior half of the basal margin are some short ribs, parallel with those last described, and which arise abutting against the lowest of the antero-posterior ribs, and reach the margin, becoming oblique forward until the most anterior becomes nearly parallel with the rib against which it originates.

Length 1.75 inch; width 1.3 inch.

From Pataula Creek, Georgia; Dr. Little.

This very peculiar shell has an internal cast not unlike *T. thoracica*, with which it is found associated; but its surface sculpture is unlike any other species with which I am acquainted. I have two fragmentary specimens before me, showing part of the surface but none of the antero-basal ribs described above. The details of the description are drawn from the impression of an entire surface in a hard sandstone.

VENILIA, Mort.

V. Conradi, Morton, Syn. p. 67, pl. 8, f. 1-2.

A cast of this species occurs in the same block with one of the casts of the preceding.

IDONEARCA, Con.

A genus represented in the Cretaceous of New Jersey alone by about a dozen species. Some of these are as yet undescribed for want of sufficient material, and most of them are known only from internal moulds.

I. vulgaris, Morton (sp.).

Cucullæa, id., Morton, Syn. Cret., p. 64, pl. 3, f. 8, and pl. 13, f. 5.

The commonest species. Casts (pl. 13, f. 5) are abundant in the marls, and are known as "squirrel heads" by the country boys. The cast is recognizable by its oblique form and prominent remote beaks. Dr. Morton described the shell from specimens from Arneytown, N. J. (pl. 3, f. 8). It is variable in its obliquity and convexity, the umbonal ridge being sometimes arched backwards and sometime straight, as seen from the side; the posterior face is nearly flat. The area is large.

I. neglecta, Gabb.

Cucullaea, *id.*, Gabb., Proc. Acad., 1861, p. 326.

This species is not rare in the marls of New Jersey, and I have seen casts from the white limestone of Prairie Bluff, Ala., apparently belonging to it. Recently I have obtained from Prof. Cook, State Geologist of New Jersey, specimens from the New Jersey white limestone (Timber Creek limestone) in which the shells are in a beautiful state of preservation. The valves are subcompressed; beak small, placed a little in advance of the middle; area narrow, about half as long as the shell, and marked by very few impressed lines; hinge thin, median teeth few and small, lateral teeth long, narrow, and few. Base and anterior end regularly and broadly curved; posterior side convex and sloping, not angulated at the base. No umbonal ridge; surface regularly convex, sloping in a little, more abruptly on the posterior side than elsewhere. Surface smooth, marked only by a few obscure lines of growth.

Length 1.75 inch; width 1.4 inch; height of single valve 0.4 inch.

I. Carolinensis.

Shell subquadrate, convex, hinge line just one-half the length of the shell; beaks small, incurved, umbones prominent and rounded; posterior slope nearly vertical; anterior end regularly rounded, retreating obliquely below; base broadly convex, most prominent in the middle. Surface in the adult marked only by irregular lines of growth; in the young crossed by very numerous and very fine radiating lines; hinge small. In the adult the middle (transverse) teeth show a tendency to irregularity, and even partial obliteration. Lateral teeth perfectly parallel with the hinge line; area small. Internal plate thin and elevated.

Length 2.0 inches; width 1.5 inch; depth of single valves .75 inch.

This species grows about the size of *I. vulgaris*, but is less oblique, with rounder outlines and a more central beak. The area is smaller, and the whole shell is more quadrate. The markings of the young shell are as minute as those of *Trigonarca Saffordi*, G., but of a different character, and the present species is proportionally shorter, more oblique, and more convex than that. *I. capax*, Conrad, is a heavy shell, remarkably thick, and will, I think, prove to be identical with *vulgaris*. I referred it to *antrosa* by

mistake in the Synopsis of Cret. Mollusca for that species. From *I. neglecta* this species can be at once distinguished by the more convex valves and by the umbonal angle.

From the Ripley Group, Snow Hill, N. Carolina.

I. *Alabamensis*, n. s.

Shell convex, oblique; area less than half the length of the shell; very narrow; beaks small, approximating; umbones small; anterior end broadly rounded, not retreating below; base convex in front, straight behind; posterior side oblique, uniting with the base by a marked angle; umbonal angle rounded, but narrow and abrupt; posterior face truncated; hinge narrow.

Length 1.5 inch; width 1.25 inch; depth of single valve 0.6 inch.

The nearest ally of this species is the preceding. It can be distinguished by the smaller beaks, much narrower area, the broader anterior end, the base straight behind, instead of being regularly convex, and by the strong umbonal angle and more truncated posterior end.

I have not attempted to describe the surface, since although the shell is well represented in all its details, except that, in the specimen before me, the shell substance has been replaced by a boring sponge (? *Cliona*); the shell itself has disappeared and the sponge has taken exactly its form except a thin outer film. Even two or three strong concentric lines of growth have left their impression on the sponge. This unique specimen, which might well serve as the type of two species of widely different organisms, is from the white limestone of Prairie Bluffs, Ala.

? **I. *antrosa*, Mort. (sp.)**

Cucullæa, *id.*, Morton, Synopsis, p. 68, pl. 13, fig. 6.

A very convex form, almost as short as an *Axinæa* with central beaks and a strong internal plate. The species is only known from casts, although it was described over forty years ago. Its hinge line is so curved that it may prove eventually to be a *Trigonarca*, and may even belong to Conrad's subgenus *Breviarca*. I have placed it under the above genus in accordance with the opinion of Mr. Conrad, with whom I have consulted on the subject.

I. sp. ?

Associated with the casts of *antrosa* are some of a more elongated and angulated form, evidently an undescribed species.

Besides the difference of outline, it has a remarkably thick internal plate running far up into the cavity under the umbones. A mashed shell from Haddonfield, found by Mr. Conrad, and evidently of this species, shows the surface to be plain, marked only by lines of growth.

The Academy's collection contains also two other species of this genus from New Jersey, represented by internal casts, but which I refrain from describing, trusting that we may obtain more material in the future.

I. Littlei, n. s.

Shell very large, oblique, gibbous, beaks large, prominent, remote, incurved; area broad; anterior end prominent, narrowly rounded, retreating below; posterior end obliquely sloping; base nearly straight, most prominent below the beaks; internal plate very large, prominent and continued up into the cavity under the beaks. Surface marked by coarse lines of growth.

Length (of casts) 5 inches; width 4.8 inches, greatest transverse diameter 4 inches.

This enormous species, not surpassed in size even by *Arca grandis*, is described from a nodular mass showing at the same time the impression of the surface and the mould of the interior. I take pleasure in dedicating this, the largest species of the family, to the State Geologist of Georgia, despite the fact that the name might be punningly suggestive of a specific character, especially inappropriate. It is from Pataula Creek, Georgia.

NEMODON, Con.

N. angulatum, Gabb.

Leda, id., Gabb, Proc. Acad. 1860, p. 94, pl. 2, fig. 12.

A re-examination of this species shows it to belong to Mr. Conrad's genus.

TRIGONARCA, Con.

T. euneata, n. s.

Shell small, oblique; beaks slightly in advance of the centre, small, incurved, and approximated; area very small and marked by numerous transverse lines; anterior end produced, narrowly rounded, most prominent below; posterior side very sloping, the posterior end of the area being barely visible beyond the umbonal ridge; below the posterior end is narrow and caudate, almost like some *Crassatellas*; base slightly convex in advance, nearly

straight, or even a little concave and sloping upwards behind; umbonal ridge strongly marked; posterior face truncated; surface marked by obsolete radiating lines, and by stronger lines of growth. Hinge broad and with numerous radiately placed teeth.

Length 1.1 inch; width 1.0 inch; depth of valve 0.3 inch.

Very closely allied in generic character to *T. Maconensis*, Con., the type of the genus, but differs in its small size, the measurements being given from the largest of a large series. In shape it differs in being proportionally much larger, less produced in front and more produced behind, and in having a less rounded base.

Of about the same size as *Breviarca Carolinensis*, Con., it is a more robust shell, with a stronger umbonal ridge; is caudate behind instead of being convex; is less prominent in front, and is altogether a much more triangular shell.

Abundant at Patanla Creek, Clay Co., Georgia.

AXINEA, Poli.

A. hamula, Morton, sp.

Pectunculus hamulus, Morton, Syn. Cret., p. 64, pl. 15, f. 7.

? *A. bellasculpta*, Con., J. Acad., 2 s., v. 4, p. 295.

The posterior extremity is *not* angulated as described by Dr. Morton. His description and figure would be unintelligible without his types. His specimens are slightly truncated posteriorly though very faintly, and others are equally round on both margins. There seems to be a considerable difference in the amount of convexity in the species, and, although I have not seen so many specimens as I would like, I think fuller series will prove that there is no difference between this and *A. subaustralis*, d'Orb. (*P. australis*, Mort., not Quoy). The only character depended on is the convexity, and that certainly varies very much in Georgia specimens sent me by Doctor Little. In fact, in some cases I am in doubt whether to call them by one or the other name, with Dr. Morton's types beside them. With about the same longitudinal and transverse diameters, the deepness of the valve of Morton's original *hamula* is .5 inch, while that of *Australis* is .25 inch. All of the casts (there are no shells) from New Jersey, are of this latter form, though Dr. Morton speaks of them as another species. The character on which Mr. Conrad separated *A. bellasculpta* is visible on some of the Georgia specimens, to a less degree than on his types from Mississippi, and on comparing the whole series, I

can find no valid ground for a specific distinction between them and *A. hamula*.

NUCULA, Lam.

N. percrassa, Con.

Journ. Acad., 2 s., v. 3, p. 327, pl. 35, f. 4.

A fine species, common at Pataula Creek, Ga.

N. Slackiana, Gabb.

Leda, *id.*, G., Journ. Acad., 2 s., v. 4, p. 397, pl. 68, f. 37.

This was described from casts in the marls of New Jersey; the surface characters have never been obtained, but from its size and shape I have little doubt it will prove identical with *percrassa*.

NUCULANA, Link.

Leda, Schum.

It is doubtful if the names of Link should be regarded. To all intents and purposes his book was never published, although printed, until the names were resurrected by Mörch. I, however, under protest, follow H. & A. Adams, Stoliczka, Conrad, and Meek in the use of this name, regretting the habit so common of "reducing scientific nomenclature to a branch of archæological research."

N. protexta, Gabb (sp.), Meek, Check List, No. 204.

Leda, *id.*, Gabb, Journ. Acad., 2 s., v. 4, p. 303, pl. 48, f. 23.

A single specimen from Pataula Creek, Georgia.

CAMPTONECTES, Agas.

C. Burlingtonensis, Gabb.

Pecten, *id.*, Gabb., Journ. Acad., 2 s. v. 4, p. 304, pl. 48, f. 25.

One of our finest *Pectens*. It was described from a very perfect mould in the brown sandy marl of New Jersey. Since then Mr. Conrad has found the shell in the Ripley marl of Haddonfield, New Jersey. The right ear of the lower valve is long and narrow, and has a very deep, narrow sinus. The surface is marked by regularly placed thin subsquamose plates surmounting each a small concentric ridge. Between these plates are visible very minute radiating impressed lines. This radiating sculpture is only visible on well-preserved specimens, and, while it takes the directions common in Agassiz's genus, it differs from all the previously described species in its almost invisible character.

SINCYCLONEMA, Meek.

S. simplicius, Con., Meek, Check List Cretaceous, No. 196.

Pecten, *id.*, Con., J. Acad., 2 s. v. 4, p. 283, pl. 46, f. 44.

This little shell grows to a diameter of 0.6 inch, and is an abundant fossil. In the older specimens, many are marked by strong concentric squamose ridges, between which are microscopic radiating lines.

NEITHEA, Dronet.

N. complexicosta, n. s.

Shell moderate in size; lower valve deeply convex, upper valve unknown. Surface marked by six large ribs, regularly distributed at equal distances, between each pair of which are two smaller ones. Each rib, large and small, is divided on its upper surface into three thread like ridges; the interspaces between the ribs are regularly concave, and without longitudinal marking; entire surface crossed by minute, regularly placed subsquamose lines.

Length one inch. Locality, Uniontown, Ala.

A very pretty species, of the typical shape of *N. quinquecostata*, etc., but differing from all the described species in the character of its ribs. It is probably nearest to D'Orbigny's *N. striato-costata*, but the large and small ribs are more nearly equal in size, and they differ in the manner in which the ribs are ornamented. In our species, the broad concave interspace rounds up to nearly the full height of the rib, and only on the top does it show the two grooves which divide it into three little linear ribs. *N. alpina*, D'Orb., has the same number of large and small ribs, but they are rounded and plain on top.

ANOMIA, Linn.

A. argentaria, Morton, Syn. p. 61, pl. 5, f. 10.

A. tellinoides, Mort., *loc. cit.*, p. 61, pl. 5, f. 11.

A. sellaeformis, Con., J. A., 2 s. v. 3, p. 330, pl. 34, f. 6.

I have compared large suites, including Dr. Morton's original specimens, and conclude that all three of the above names must go together. The differences depended on for the separation were only those of outline, and there is no possible ground for the second specific name given by Dr. Morton. Mr. Conrad's name was given to a single specimen distorted by growing on an irregular surface. The species is common at Pataula Creek, Georgia,

and grows to more than an inch in diameter. The most regular form, before the shell becomes distorted, is nearly circular, with a well-marked little beak, adjoining to, and sometimes overhanging the cardinal margin. The surface is faintly squamose and ornamented by microscopic radiating lines.

Accompanying these is another form, represented by no less than fifteen specimens agreeing well with one another. Unlike the typical *A. argentaria*, they are ornamented by a uniform pattern, clearly not the impression of a surface, to which they were attached. In form and size they do not differ from *A. argentaria*, but the ornament is a series of radiating ribs, one set large, flattened on top, and well defined; between these are interpolated from one to three smaller ribs. In most cases this alternation is well defined; though in two or three the large ribs are nearer in size to the small ones. On the typical *argentaria* this radiation is never observed, even in a rudimentary manner, and on some of my specimens it begins at the very apex; but on several the first half inch in diameter, or less, of the shell does not differ from *argentaria*, while after that the ribs begin, first on thread-like lines, finally developing to full size. In consequence of this I feel reluctant to separate the form as a distinct species, believing that more material will merge the two. I therefore content myself with proposing the name of *A. argentaria*, var. *ornata*.

PARANOMIA, Con.

P. Saffordi, Con., Journ. Acad., 2 s. v. 4, p. 290, pl. 46, f. 21.

Several specimens from Pataula Creek, Georgia.

OSTREA, Linn.

O. subspatulata, Fbs., Quart. Journ. G. Soc., v. 1, p. 61.

Five miles north of Lumpkin, Stewart County, and near Fort Gaines, Georgia; Dr. Little. The species is characterized, even when not two inches long, by a tendency to great thickening of the upper half, the lower half being a thin tongue-like process.

O. larva, Lam., A. S. V., v. 6, p. 216.

O. falcata, Morton, Syn., p. 50, pl. 3, f. 5.

Not common at Georgetown, Quitman Co., Georgia.

O. plumosa, Morton, Syn., p. 51, pl. 3, f. 9.

With the preceding.

O. pusilla, Nills., Petr. Suec., p. 32, pl. 11, f. 7, *a-c*.

O. tecticosta, Gabb, Journ. Acad., 2 s. v. 4, p. 403, pl. 68, f. 47, 48.

From Georgetown, Pataula Creek, and five miles north of Lumpkin, Stewart County, Georgia. Some of the specimens are much larger and broader than those from Tennessee and New Jersey, from which I described the species. I am convinced that not only is this shell identical with the Swiss species, but, by looking over Nillson's work, there are nearly a dozen others that will probably prove synonymous. Among these might be mentioned *Gryphæa lateralis* and *Ostrea larva*, of which the broad form, called by Nillson *O. lunata*, also occurs in New Jersey.

***O. Bryanii*, n. s.**

Shell moderate in size, subtrigonal, oblique, irregular in outline, rather thick. Lower valve deep, upper valve flat, or more or less concave towards the basal margin. Shell usually free, sometimes showing signs of attachment near the beak; surface irregularly squamose, more so as it grows older; a few broad but not very prominent radiating lines or ribs are visible usually, though not always, on the most convex part of the lower valve. I have never observed any on the upper valve. Hinge long, triangular, deeply grooved in the middle, and strongly deflected to the left side. Inner margin crenulated, though sometimes obscurely, near the hinge. Muscular scar large.

Usual size about 1 inch to 1.5 in length; I have one specimen three inches long.

Found abundantly near Vincenttown, New Jersey, in the marl at the top of the Cretaceous, by Col. Bryan. In a few minutes, in company with that gentleman, I collected more than fifty specimens on the marl heaps of the West Jersey Marl Co.

***O. Littlei*, n. s.**

Shell small, irregularly elongate-falcate to subtriangular; more regular in the young state; thin. Young shell marked, at least on the lower valve, by faint radiations, which become obsolete in the adult; these are crossed by unusually faint lines of growth, not squamose. Hinge elongate, triangular, deflected to the left. Associated with the lower valves are some upper ones of corresponding form and size, with the same surface markings except that they are not radiated even towards the beaks. The margins are crenulated, corresponding to the ends of the radii in the lower valve.

Length of largest specimen 2.5 inch ; width 1.0 inch ; depth of lower valves 0.5 inch.

From Pataula Creek and Georgetown, Georgia. I have also found some valves of this species among the undetermined oysters sent me in 1860 by Prof. Safford from the Ripley Marls of Tennessee.

Nearly as smooth as *O. plumosa*, Morton, this shell differs in its more triangular form, elongate, and somewhat bent ; the lower valve is subangular and deep, and the young shell has radiations which point to a resemblance to some of the more triangular forms of *O. larva*. From that species it differs in being less falcate than the shortest and broadest specimens, and in having a mere trace of the radiations and none of the marginal plications.

O. exogyrella, n. s.

Shell subequivalve, nearly equilateral, elongate, more or less quadrate ; sides subparallel, cardinal margins more or less sloping ; beaks usually nearly median, sometimes a little deflected ; base rounded ; surface marked by distant subsquamose lines of growth not radiated at any stage ; hinge broad, shallow, normally triangular, varying to nearly subquadrate.

Length 1 to 2 inches ; usual proportion a third longer than wide.

From Pataula Creek and Georgetown, Georgia ; Dr. Little.

I have purposely omitted a very important point in the above diagnosis, to mention it more in detail here. The shell shows an additional character, which I have failed to discover in any other true oyster, and which shows the transitional character from *Ostrea* to *Exogyra*. Fortunately, I have a good series of specimens, and every lower valve possesses a "nuclear whorl," if I may be permitted to use such a phrase in connection with a bivalve. In other words, up to a diameter of nearly a quarter of an inch, every specimen has been a well-characterized *Exogyra*. After this the direction of growth changed to a right line, and the spiral is partially imbedded in the succeeding layers, or projects as a slightly deflected tip or beak on an unusually symmetrical oyster. This spiral is on the normal side of *Exogyra*, and under the deflected beak there is a slight emargination, a corresponding convexity existing on the opposite side.

This character is of the greater interest, since it is a transition to the generic characters of the species variously known as *Ostrea*, *Gryphæa* and *Exogyra lateralis*, Nilsson, Petr., Succ., pl. 7, f. 9-

10. (*G. vomer*, Morton, Syn. Cret. p. 54, pl. 9, f. 5.) This shell is a well-marked *Exogyra* in its young state, but in some cases in the adult the spiral beak is entirely covered up. Mr. Conrad proposed for this group, although I think on insufficient grounds, the subgeneric name of *Gryphostrea* in the genus *Ostrea*. This last species survived to the Eocene, where it is known in the Paris Basin as *O. eversa*, and in Maryland as *O. sub-evera*.

GYPHÆA.

G. vesicularis, Lam. (sp.), Bronn, Leth. Geog. pl. 32, f. 1.

Ostrea, *id.*, Lam., Am. Mus., v. 8, p. 160, pl. 22, f. 3.

Common at Georgetown, Georgia; Dr. Little.

G. Thirsæ, Gabb, Proc. Acad., 1861, p. 329.

This is a rare species, and seems to be confined to the neighborhood of Alabama and Georgia. I described it from the former State, and now have it from near Fort Gaines, Georgia, whence it was sent by Dr. Little. It is intermediate between the narrowest forms of *G. vesicularis* and *G. pitcherii*. From the former it can be distinguished by the sides being narrowed and sloping nearly straight from the umbone, which is narrower and more prominent than is Lanarek's species. From *G. pitcherii*, which it most resembles, it can be distinguished by being less distinctly lobed laterally; by the hinge area of the lower valve being broader and flatter, and by the beak being very minute instead of being large and incurved.

EXOGYRA, Say.

E. costata, Say, Journ. Phila. Acad., 1 ser., vol. 2, p. 43.

To the already long synonymy of this species must be added *E. interrupta*, Con., Journ. Acad., 2 s. v. 3, p. 330, pl. 34, f. 15.

I have this latter, which is only an attached lower valve of *E. costata*, of every size and of every degree of attachment from an almost total obliteration of the ribs, to a perfectly free and typical *costata*. They are marked Georgetown, and five miles north of Lumpkin, Stewart County, Georgia.

Discoidea occidentalis, Gabb.

This echinoderm was described by me as coming from the Cretaceous of Oregon. It was given me by a friend, who at the same

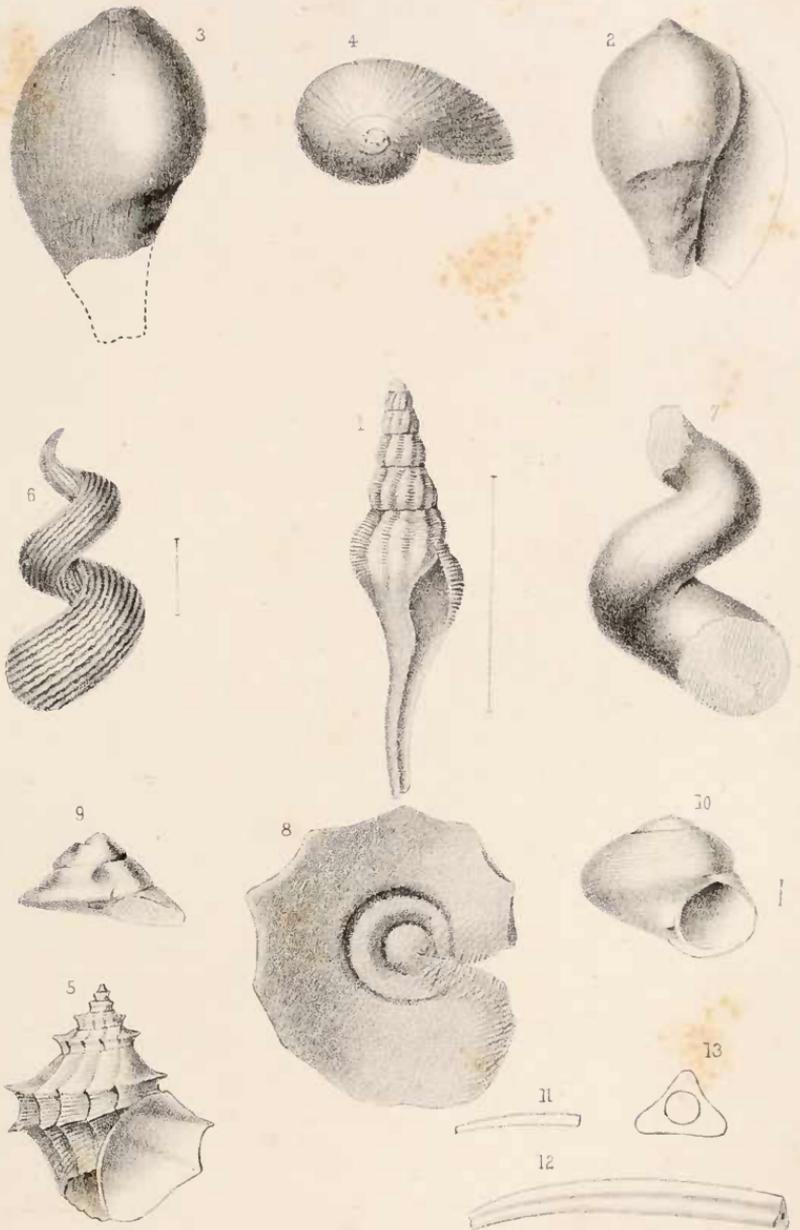
time told me that was the locality. Since then an extensive acquaintance with the Cretaceous rocks of the west coast of North America, including not a little with the geology of Oregon, renders me doubtful of the accuracy of the information. The specimen is preserved in a light-colored limestone, entirely unlike anything I know of in our Pacific States, but which looks suspiciously like some Cretaceous rocks I have seen from Peru. It may consequently prove to be a South American fossil, though this is only a conjecture.

PALIURUS. New Genus.

A free serpuloid tube, usually with a triangular cross section externally; circular internally; tube straight or slightly twisted or bent.

P. triangularis, n. s., pl. 17, f. 11, 12, 13.

I propose this name for a common little annelid in the white limestone, found especially abundant at Vincenttown, New Jersey. It is free, and, as above described, has an external triangular cross section; the two ends are open, and the apertures are circular. The carinæ are subangular or rounded, the sides more or less deeply grooved, and the entire shell, usually about three-fourths of an inch long, is slightly twisted or irregularly curved, though varying little from a straight line. The diameter is about .06 or .07 inch.



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