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**SYNOPSIS**  
OF THE  
**ORGANIC REMAINS**  
OF  
**THE CRETACEOUS GROUP**  
OF  
**THE UNITED STATES.**  
**ILLUSTRATED BY NINETEEN PLATES.**

TO WHICH IS ADDED AN APPENDIX, CONTAINING A TABULAR VIEW OF THE TERTIARY  
FOSSILS HITHERTO DISCOVERED IN NORTH AMERICA.

BY  
**SAMUEL GEORGE MORTON, M. D.**  
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THE ALBANY INSTITUTE, &C.

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"Je regarde les caractères d'époque de formation tirés de l'analogie des corps organisés, comme  
de première valeur en Géognosie, et comme devant l'emporter sur toutes les autres différences  
quelque grandes qu'elles paraissent."

---

AL. BRONGNIART.

**PHILADELPHIA:**  
**KEY & BIDDLE, MINOR STREET.**

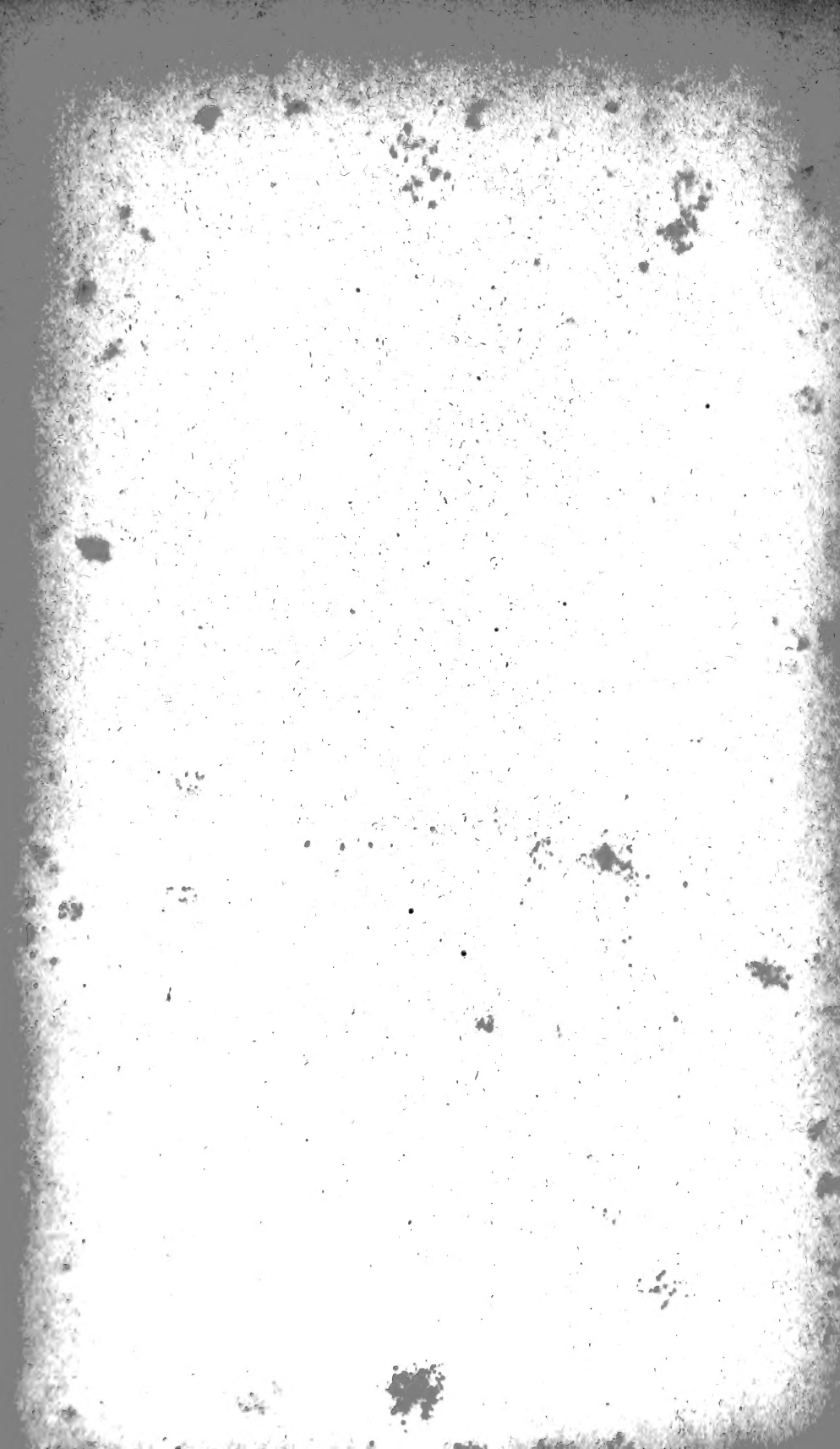
W. P. Gibbons, Printer.

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1834.



TO  
GIDEON MANTELL, Esq.,  
F. R. S., L. S., G. S., &c. &c.  
OF BRIGHTON, ENGLAND,  
DISCOVERER OF THE IGUANODON AND HYLÆOSAURUS,  
THIS WORK  
IS MOST RESPECTFULLY INSCRIBED  
BY  
HIS VERY OBLIGED AND VERY GRATEFUL FRIEND,  
THE AUTHOR.



## PREFACE.

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IN Mr. Maclure's "Geology of the United States," the formation we are about to examine is called alluvial, without any specific reference to the contained fossils, which at the time that work was published, were almost unknown: several of them were subsequently described by Mr. Say, who, however, took little notice of their geological relations.

Dr. Harlan has written several papers on the Marl of New Jersey, with particular reference to fossil osteology; and Dr. Dekay has more recently pursued the same interesting investigation.

Mr. Vanuxem's memoir on the Secondary, Tertiary and Alluvial formations of the United States, embraces brief, but important views of the arenaceous deposit of this Synopsis, which he was the first to identify with the Chalk series of Europe, although he does not refer it to any particular division of the Chalk.

With these and other aids, all of which will be more specifically acknowledged hereafter, I applied myself to the study of what has been termed the "Marl region" of this country; and my object was greatly promoted by the extensive excavations at the Chesapeake and Delaware canal. I have also had access to nearly all the public and private collections of which marl fossils form a part; and in this respect owe much to the kindness of my friends Dr. Blanding, Mr. J. P. Wetherill, Mr. Nuttall, Prof. Hitchcock, Mr. Cooper, Dr. Dekay, Dr. Z. Pitcher and Mr. T. A. Conrad. The last named gentleman, although he has not written on this portion of American geology, has contributed as much as any one to its elucidation; and to him also belongs the honour of first identifying and making known the Calcaire grossier, or Eocene, of Alabama.

The first edition of this *Synopsis* was read before the Academy of Natural Sciences of Philadelphia, in the autumn of 1829, and published in

the American Journal of Science and Arts, in January of the succeeding year.\*

In consequence of the facilities afforded me for this inquiry, several genera of organic remains are now noticed for the first time as occurring on this continent; and it will be observed that two new genera and many new species of Testacea have been added to this edition.

I may add, that up to the present time eight only of the fossil shells and zoophytes noticed in this work have been described, and but four of them figured by other naturalists.

I have endeavoured, in this edition, to correct the inaccuracies of my former papers, and good artists have been employed to furnish the accompanying illustrations, consisting of nineteen plates, and one hundred and sixty figures, which almost without exception, possess the merit of great accuracy. The care bestowed on these illustrations, precludes the necessity of those minute specific details in the text, which would have been otherwise indispensable.

*Philadelphia, January 1st, 1834.*

\* Vols. XVII and XVIII; plates in the latter volume: my other papers, also illustrated by plates, will be found in Vols. XXII, XXIII and XXIV; and in Journ. Acad. of Nat. Science, Vol. VI, from 1827 to 1830.

## CRETACEOUS GROUP OF THE UNITED STATES.

### EQUIVALENTS IN EUROPE.

*Ferruginous Sand.* Mr. Vanuxem was the first to detect the analogy between this deposit and the chalk formation of Europe; although, as mentioned in the preface, he did not refer it to any particular division of the chalk. My first essay,\* published simultaneously with Mr. Vanuxem's, suggests its analogy to the *lower mass* of the cretaceous group, called by the French *la craie inferieure ou ancienne*, which in England is designated as the *Green Sand Formation*, or *Ferruginous Sand Series*.†

My subsequent researches during seven years, have fully confirmed the preceding opinion.

*Calcareous Strata.* These were first noticed by myself in the year 1829. A careful examination of a great number of organic remains has induced me to consider

\*Journ. Acad. Nat. Science, Vol. VI. p. 97. 1827.

†Coneybeare and Phillips describe the Ferruginous sand of England as composed of these four subdivisions, counting from below :—1, Iron sand; 2, Weald clay; 3, Green sand; 4, Chalk Marl. (Geol. pp. 60, 120 &c.) The whole series, embracing the White Chalk, is now very generally called the *Cretaceous Group*.

these beds as of the same age as the white chalk of Europe: but as the American strata contain, as will be shown hereafter, some Tertiary shells, a positive decision must be deferred, until sanctioned by further observation.

#### MINERALOGICAL CHARACTERS.

1. *Ferruginous Sand.* The mineralogical characters of this deposit are extremely variable, consisting however, for the most part, of minute grains collected into friable masses of a dull bluish, or greenish colour, often with a shade of gray. A hundred grains of the green variety gave Mr. Seybert the following constituents:—

Silex,	49.83
Alumine,	6.00
Magnesia,	1.83
Potash,	10.12
Water,	9.80
Protóx. of iron,	21.53
Loss,	.89
	<hr/>
	100.00

In a less cautious analysis by Mr. J. P. Wetherill and myself, of an apparently similar marl from another locality, we obtained silex 49.00, protoxide of iron 30.00, alumine 5.50, and lime 4.70. Hence it appears that the predominant constituents of these marls are silex and iron. They often contain beds of dark blue, tenacious clay, which is sometimes mixed with the marl, forming the *marly clay* of Mr. Peirce: in other instances the two are disposed in alternate layers.

Again, these earths are of a yellowish brown color, friable or compact, and filled with green specks of silicate of iron. Some of the greenish varieties are extremely indurated, rendering it difficult to separate the contained fossils. The friable blue marls sometimes embrace a large proportion of mica in minute scales, similar to the beds described by Mr. Mantell, (South Downs, p. 77,) as occurring in the green sand of Sussex, England.

Other localities present beds of siliceous gravel, (turritia? of the French,) the pebbles varying in size from coarse sand to an inch in diameter: these are either insulated or cemented by green phosphate and brown oxide of iron, and contain a profusion of fossils.

At the Chesapeake and Delaware canal, I observed a fine siliceous sand of a green color, answering to the *glauconie sableuse* of Brongniart: also, a white sand with abundance of lignite, which, however, appears to be much more recent than the cretaceous formations.

The friable blue marls seldom contain more than five per cent. of lime, and often no trace of it, as in the analysis of Mr. Seybert; but Mr. Vanuxem remarks that the proportion of this earth increases in the southern states.

The diversified appearances above mentioned, pass by insensible degrees into each other, producing an almost endless variety of mineralogical characters.

The mineral substances found in these marls, are iron pyrites in profusion; succinite, lignite, and spheroidal masses of a dark green color, and compact, sandy structure, probably analogous to those found in the green sand

of France.\* They are one or two inches in diameter ; and although their structure is not organic, they often have a shark's tooth or a shell, for a nucleus. Can they be Coprolites? Larger spheroidal bodies also occur, with fissures radiating from the centre, like those of the clay iron-stone so common in England.

Lignite is extremely abundant : it is found in the lower strata of the Chesapeake and Delaware canal, in almost every variety, from charred wood to well characterized jet. Even the limbs and trunks of trees have been there found many feet in length, and perforated by the teredo.†

2. *Calcareous strata*. These consist of several varieties of carbonate of lime, of which the following are the most remarkable :

An extremely friable mass, containing at least thirty-seven per cent. of lime, with a considerable proportion of iron, silice &c. It appears to be almost entirely composed of disintegrated zoophytes.

A yellowish or straw colored limestone, as hard as the carboniferous varieties ; it contains numerous organic remains.

A granular or subcrystalline limestone, intermediate in structure between the former two, and embracing similar fossils.

\* Cuv. and Brong. Desc. Geol. des env. de Paris, p. 16.

† Although I am satisfied that our cretaceous strata contain lignite, yet I by no means refer all our lignites to those strata. The deposits of this kind last mentioned, lie between the deep cut of the Chesapeake and Delaware canal and its western extremity, and probably belong to a much more recent period than the chalk series. This subject is now in the able hands of my friend Henry D. Rogers, Esq.

A white, soft limestone, not harder than some coarse chalks, which it much resembles: replete with fossils.

All these varieties are occasionally infiltrated by siliceous matter, and considerable masses of chert are occasionally observed in them: they also present some appearances of the green grains so characteristic of the marls adjacent.

#### GEOGRAPHICAL DISTRIBUTION, ORGANIC CHARACTERS &c.

When my attention was first called to this subject, eight years ago, I could not trace the ferruginous sand beyond the peninsula of New Jersey, and a small part of Delaware: subsequently, however, it has been discovered in nearly all the southern states, and I now believe it to be one of the most extensive formations on this continent.

From the observations of Professor Hitchcock I have no doubt that it forms the substratum of the islands of Nantucket and Martha's Vineyard, on the coast of Massachusetts. Long Island will doubtless prove a link in the same series. But this formation is first unequivocally recognized in New Jersey, whence it may be locally traced through Delaware, Maryland, Virginia, North and South Carolina, Georgia, Alabama, Mississippi, Tennessee, Louisiana, Arkansas and Missouri.

These various deposits, though seemingly insulated, are doubtless continuous, or nearly so, forming an irregular crescent nearly three thousand miles in extent; and what is very remarkable, there is not only a generic accordance between the fossil shells scattered through this vast tract, but in by far the greater number of compari-

sons I have hitherto been able to make, the same *species* of fossils are found throughout: thus the *Ammonites placenta*, *Baculites ovatus*, *Gryphæa vomer*, *Gryphæa mutabilis*, *Ostrea falcata* &c., are found without a shadow of difference, from New Jersey to Louisiana: although some species have been found in the latter state that have not been noticed in the former, and vice versa.

Again, the calcareous strata appear to be much less extensively distributed than the friable marls, and present considerable difference in their organic characters, as will be noticed in detail hereafter. Again, they appear to form, in all instances, the superior or overlying beds of this formation.

In my first paper on this subject I mentioned some geological resemblance between the marl of New Jersey and the strata of the celebrated plateau of Maestricht, on the Rhine.\* My friend Mr. Mantell, however, to whom I have sent specimens, points out a yet stronger analogy between our *calcareous* strata and the Maestricht beds. "The latter," he observes, "appear to form, as it were, a connecting link between the chalk and the tertiary, for although, in England, France and elsewhere, there is a marked separation between the *so called* secondary and tertiary formations, I believe it will ultimately be found that this is not the natural order, but the exception; and that the transition from one to the other was gradual. In the Maestricht beds we have the Ammonites, Baculites, Echini &c., so characteristic of the chalk, associated with Volutes, Turritellæ, and other Tertiary genera."

\* Journ. Acad. Nat. Sci. of Philad. Vol. VI. p. 97.

By reference to the following synopsis, it will be remarked that there is a striking analogy between the American calcareous strata and the upper chalk of Europe.

The opinion is held by some geologists, that a transition group exists between the Secondary and Tertiary deposits of some parts of Europe: thus at Gosau,\* in the eastern Alps, *Trigonia alæformis*, *Pecten quinque-costatus*, and a few other well known secondary fossils, are said to be associated with a variety of tertiary remains. M. Dufresnoy also observed among two hundred fossils of the Pyrenean chalk, fifty species possessing tertiary characters. I am aware that M. Deshayes doubts the accuracy of the observations in reference to Gosau, but Mr. Conrad has verified the geological fact of the mixed nature of some formations, during his late researches in Alabama, of which notice will be taken in another place.

The following diagram will serve to convey an idea of the cretaceous group, in reference to the other formations in this country: no known section, however, exhibits all these strata in conjunction.

Modern.	{	Alluvium	Cretaceous Group.
		Erratic group	
Tertiary.	{	Quarternary, or Newer Pliocene	
		Upper Marine, or Older Pliocene	
		London clay, or Eocene	
Secondary.	{	Calcareous strata	
		Ferruginous sand	

\* Trans. Geol. Soc. of London, vol. iii. (N. S.) p. 360.

With respect to the basis on which the ferruginous sand rests, I know nothing with certainty ; for, although the strata have been penetrated nearly one hundred feet at the Chesapeake and Delaware canal, they afford no answer to this question. But I am disposed to believe that in the northern states this formation rests on primitive rocks, and in the southern states, especially in Alabama, on the old secondary limestone. The latter opinion has recently been much corroborated by the researches of Mr. Conrad. If hereafter it should be proved that the northern section of our cretaceous group rests upon primitive rocks, as just suggested, it will be similarly circumstanced to the same formation in Sweden, where, according to Mr. Nilsson, the chalk is generally incumbent on gneiss. Again, in the Carpathian mountains, the chalk and granite are in immediate contact.\*

#### NEW JERSEY.

*Ferruginous Sand.* In New Jersey, the tract which has long been known by the name of the "marl district," may be located as follows:—Draw two lines, one from Amboy to Trenton, the other from Deal to Salem ; let the Atlantic ocean connect the eastern, and the Delaware river the western points of these lines : this irregular oblong tract incloses nearly the whole marl deposit of New Jersey ; so far, at least, as it has hitherto been explored. There is reason, however, to suppose that it occupies a much larger proportion of the peninsula, espe-

\* De la Beche, Geol. Man. pp. 256.

cially in some places overlaid by deep deposits of clay and sand, as at Bordentown, White Hill &c. In other localities, the older Pliocene (Upper marine) overlies the secondary, as is the case a few miles from Salem. Above all these deposits is mostly found a uniform covering of gray sand, referred by Mr. Vanuxem to alluvial origin; yet we often observe the marl, with its peculiar fossils, immediately beneath the soil.

These fossils, as will hereafter be shown, are of a very striking character, occasionally grouped in vast numbers, and in other instances almost wholly absent. The genera *Gryphæa*, *Exogyra* and *Belemnites*, are found abundantly throughout. Near Egypt, on the margin of Crosswick's creek, and at Ralph's mill, near Hornerstown, *Terebratulæ* occur in prodigious numbers, but under different appearances: at Egypt, for instance, is a series of thin strata, some filled exclusively by *Terebratulæ*, others by *Gryphæa*, so disintegrated as mostly to fall to pieces on removing them from the marl. Near Hornerstown, on the contrary, the *Terebratulæ* are found in a very indurated matrix in the bottom of a rivulet, and in perfect preservation. Near Walnford, *Exogyra* and *Belemnites* predominate: at Arneytown, these genera are associated with *Ammonites*, *Baculites* &c. The marls of the whole of Monmouth county are similarly characterized, especially those near Middletown, the Nutt swamp &c.

Mullica hill, in Gloucester, presents a naked elevation of forty or fifty feet, composed of sand and small quartz

pebbles, in fact a siliceous gravel, cemented by green phosphate and brown oxide of iron, and embracing a vast quantity of the usual marl fossils, especially Gryphæa, Exogyra and Belemnites: the former two, however, are usually so charged with iron as greatly to impair their characters, and the Belemnites are either more or less decomposed, or replaced by crystallized phosphate of iron. The gravel is not superficial, but may be observed to a depth of many feet.

As this gravel forms an exception to ordinary appearances, it at first occurred to me that it might have been derived from a partial mixture on the surface of diluvial debris.\* An instance of this kind occurs on Mr. Forsyth's land, near Pemberton, where the diluvial gravel has torn up the marl, and the two are mingled together; and among the characteristic constituents of the former, were found several masses of anthracite coal, of which there is no locality short of an hundred miles.

*Calcareous Strata.* The calcareous beds have been traced as far south as Salem, and north to Vincentown, a tract nearly sixty miles in length, in a direction nearly parallel to the Delaware river, and from seven to ten miles east of it. These beds are marked throughout by the several varieties of calcareous rock already described, (p. 10,) and characterized by abundance of Zoophytes, Echini, and a few species of shells. These fossils, with

\* Should the gravel be hereafter found to form an integral part of these beds, it will be no anomaly in this formation, for the same phenomenon occurs in the lower green sand strata in England.—*Coneyb. and Phil. Geol.* p. 137.

a few exceptions, have also been found in the arenaceous bed; but many of the organic remains of the latter are not observed in the limestone strata, which have not yielded any multilocular univalves, unless the doubtful fossil, *Belemnites? ambiguus*, be of this character: neither do they contain *Terebratulæ* or *Exogyra*.

#### DELAWARE.

*Ferruginous Sand.* In this state, the blue and gray friable marls extend in the line of the Chesapeake and Delaware canal, from St. Georges almost to the western lock. St. Georges and its vicinity afford *Gryphæa* and *Exogyra* in great numbers, with *Ostrea falcata* and some *Belemnites*. The deep cut of the canal abounds in *Ammonites*, *Baculites*, and *Scaphites*, without any of the fossils previously mentioned. This locality consists of a series of pyritous sands and clays, in which the shells have decomposed, leaving only the casts. The excavation here has been deeper than in any other locality, and a register kept of its mineralogical and other features. I am indebted to Mr. A. A. Dexter, one of the Engineers, for two vertical sections of the strata, one taken at the summit level, the other about a quarter of a mile west of that point.

It will be observed that these sections are transverse with respect to the canal, which runs nearly east and west.

SECTION, No. 1. *Pl. 14, upper figure.* Deepest section of the deep cut. Vertical depth,  $82\frac{1}{2}$  feet.

1. A series of white, yellow and brown sands and gravel,

traversed by iron crusts, and containing large masses of primitive rocks. Depth  $35\frac{1}{2}$  feet.

2. Argillo-micaceous sand, of a dark blue color. Organic remains few and indeterminate. Depth  $28\frac{1}{4}$  feet.
3. Argillo-ferruginous sand, of a greenish color, abounding in Ammonites, Baculites, Pholadomyæ, Lignite, Succinite &c. Depth, 4 feet.
4. Coarse gray sand, with similar organic products as No. 3. Depth 7 feet. This stratum forms the bottom of the canal, but the excavation was made six feet deeper for experimental purposes.
5. Argillaceous sand, of a dull green color, which it imparts to water. Organic remains same as in the last beds. Depth 3 feet.
6. Coarse gray sand, which was penetrated about three feet, but no fossils were observed.

SECTION, No. 2. *Pl. 14, lower figure.* Taken 484 yards west of section No. 1. Vertical depth  $62\frac{1}{2}$  feet.

1. Ferruginous gravel and sand. *Diluvial.* Depth 9 feet.
2. Black tenaceous clay. Depth 7 feet.
3. Ferruginous brown sand and clay, containing a profusion of Ammonites and Baculites, with Scaphites, Lignite, Succinite, and casts of various simple uni-valve and bivalve shells. Depth 23 feet.
4. Blue micaceous sand and clay, with similar fossils to No. 3.
5. Ferruginous sand and clay, of a dull green color,

abounding in multilocular and other shells. Depth 6½ feet.

6. A white siliceous sand, which, about two hundred yards further west, rises twelve or fifteen feet above its level at this point, and contains Lignite in vast quantity; sometimes even the trunks of trees twenty or thirty feet long, and a foot in diameter. No other organic remains were observed in it.

The *calcareous strata* have not yet been detected in Delaware.

#### MARYLAND.

I am informed that the Ferruginous sand occurs below Annapolis, in this state, at which place it is chiefly characterized by *Alcyonia*. Mr. Conrad obtained at Fort Washington, on the Potomac, a solitary valve of *Exogyra*, indicating the presence of this formation.

#### VIRGINIA.

A writer, in the American Journal of Science, speaks of the occurrence of *Belemnites* and *Gryphæa* on James river, but gives no locality.

#### NORTH CAROLINA.

*Ferruginous sand.* This is well developed at Ashwood, on Cape Fear river, where, according to the late Mr. William Bartram,\* there are several beds of dark colored marl, containing *Belemnites*, sharks' teeth, pyri-

\* Travels, p. 477, 475.

tous Lignite &c. &c. These strata are surmounted by the usual diluvial mass to a depth of ten or twelve feet.

Mr. Conrad, during his geological journey through the Southern states, made some interesting discoveries near the town of Wilmington, N. C. which I shall give in his own words: "At this place, I found the Upper Marine formation, resting immediately on secondary limestone, precisely like that you have described as occurring in New Jersey; it is in thin layers, and reposes directly on a hard rock which is the equivalent of the Ferruginous sand, as it abounds in *Exogyra costata* and other characteristic fossils. The *cretaceous strata* are said by intelligent persons here to extend sixty miles up Cape Fear river, and from its mouth coastwise as far north as Cape Hatteras."

It seems, therefore, that the calcareous and arenaceous strata of the American Cretaceous group, wherever they have been examined, preserve the same relative position as the white chalk and Ferruginous sand of Europe.

#### SOUTH CAROLINA.

*Ferruginous Sand.*—My friend Dr. Blanding, has discovered this formation near Effingham's mill, on Lynch's creek. The fossils he has brought me are chiefly *Exogyra costata*. Mar's bluff, on Pedee river, and Nelson's ferry, on Santee river, afford the *Belemnites Americanus*.

*Calcareous Strata.*—The Calcareous strata form an extensive basin to the west of the city of Charleston: this limestone, which is of the newest Cretaceous formation

is mostly yellowish white, considerably friable, and replete with fossils, although the number of species hitherto discovered is inconsiderable. Among these, the *Ostrea cretacea* and *O. panda* occur also in the older cretaceous deposits of Alabama.

### GEORGIA.

The Ferruginous sand appears to abound near Sandersville in this state, whence I have received a number of specimens of the *Belemnites Americanus*.

### ALABAMA.

This state presents a vast deposit of both strata, for a knowledge of which I am wholly indebted to Mr. Conrad, who informs me that the counties of Pickens, Bibb, Greene, Perry, Dallas, Marengo, Wilcox, Lowndes, Montgomery, and parts of Clarke, Monroe and Conecuth, are chiefly composed of the older Cretaceous strata. In Clarke county the newer Cretaceous rock predominates.

One of the most prolific fossil localities is Prairie bluff, in Wilcox county, as will be seen in the course of this synopsis. The following diagram will convey an idea of its strata :

Feet.	2 Loam &c.
2	Ferruginous sand, generally indurated with <i>Exogyra</i> , <i>Gryphæa</i> &c.
70	Same deposit, in a friable state, with abundance of <i>Ostrea falcata</i> .
	River bed.

The older Cretaceous rock constitutes the long and perpendicular bluff at Demopolis, where it has been ascertained

by boring to be at least 500 feet thick. The more elevated bluff at Erie is chiefly composed of the same rock, which is here very friable and well characterized by fine specimens of *Pecten quinquecostatus*, as well as abundance of *Exogyra costata*. A short distance north of Erie, the Cretaceous rocks terminate, following the course of the Black Warrior; and at Tuscaloosa the old Red sandstone with bituminous coal form the bed of that river. The Tombeckbe and most of its tributaries runs entirely through a region, the substratum of which is the Cretaceous group, although it is probable that their sources originate in the Carboniferous limestone, which may extend into the north-east section of Mississippi. We learn from travellers, that the Cretaceous rocks chiefly compose the countries of the Chickasaws and Choctaws, and it is highly probable that nearly the whole state of Mississippi is of the same formation. It is worthy of remark, that all the prairies of Alabama and Mississippi have a substratum of the older Cretaceous rock. The newer Cretaceous strata prevail only in the southern portion of Alabama, are never covered with a prairie soil, and have not been observed north of the central parts of Clarke and Monroe counties.

*Nummulite Limestone*.—For the following account of this highly interesting deposit, I am indebted wholly to Mr. Conrad, who examined it personally:

“After crossing the Alabama river at Claiborne, I traversed a level alluvial country for two or three miles, when the surface becomes broken into gravelly hills covered by a pine forest. Near Sugsville the hills are

formed of the nummulite limestone, masses of which are scattered in every direction: it is porous, or contains spheroidal cavities, formed no doubt by the decomposition of organic remains, which leave loose casts that are easily washed out by the rains. The most characteristic fossil at this place is *Ostrea panda*.

“These limestone hills occur at intervals to the vicinity of Jackson, on the Tombeckbe: on Basset’s creek one of these hills rises probably to a height of 300 feet above the water level. I crossed the river at Jackson, which is on a high sloping bluff, entirely diluvial, and proceeded over a succession of pine covered hills until within a mile of St. Stephens, where the limestone again appears. St. Stephens is on a high bluff of this rock, which, wherever it occurs, forms a very broken or undulating surface. A short distance above the village, the bluff rises nearly perpendicular from the river, and is about 100 feet high. Every where in the vicinity this limestone crops out on the summits of the hills, and myriads of *Nummulites Mantelli* are scattered over the surface of the decomposing rock. The *Gryphæa vomer* is occasionally found among them, and the *Ostrea panda* is abundant, but no other fossils occur excepting what are peculiar to the limestone in question. On the hills I observed the *Pecten Poulsoni* in abundance. Near low water mark in the bluff is a stratum of shells consisting of *Ostrea panda* and *Plagiostoma dumosum*, both equally abundant. The surface of this rock is in many places very hard, and of a bluish color, compact, and glittering when fractured, and is convertible into excellent lime. Again it is often

white and friable, and so much resembles chalk that it is not surprising that it should have been mistaken for the real chalk of commerce, from which it differs in possessing a coarser and more granulated structure, and in containing a considerable proportion of argillaceous earth."

#### MISSISSIPPI.

This state has an extensive marl tract in the Chickasaw fields, near the borders of Tennessee. The characteristic fossils have been sent to me by my friend Mr. Brewster. In the Choctaw country similar fossils are also very abundant.

#### TENNESSEE.

The south western portion of Tennessee represents a continuation of the tract just mentioned, which takes a westerly direction across the Mississippi river at the Chickasaw Bluffs.

#### LOUISIANA.

Dr. Pitcher, in a recent letter, describes an extensive deposit of Ferruginous sand between Alexandria and Natchitoches. Judge Bry has also noticed it near the township of Wachita, on the Wachitta river, where it is recognized by Belemnites, Ammonites and Gryphæa.

#### ARKANSAS.

Mr. Nuttall long ago found fossils of this formation on the calcareous platform of Red river, above and below the

junction of the Kiameska ; and Dr. Pitcher, of the United States' army, now at Fort Gibson, has politely obtained specimens for my use, among which I readily identify the *Gryphæa vomer*, *Exogyra costata* &c.

#### MISSOURI.

Messrs. Lewis and Clarke, Mr. Nuttall and Col. Long, found *Baculites*, *Gryphæa* and other marl fossils at the Great Bend of the Missouri river, (lat. 43° 40' N., long. 72° W. from Washington,) intimating the existence of the Ferruginous sand in that remote region of our continent, as mentioned on a former occasion. In fact, a great part of the level country between the Rocky mountains and the Mississippi is occupied by this formation ; and I have also seen some fossils from thence, which bear a strong affinity to those of the Lias of Europe.



## SYNOPSIS &c.



### ANIMALIA VERTEBRATA.

#### REPTILIA.

#### SAURIA.

#### MOSASAURUS. *Coneybeare.*

Pl. XI. fig. 9.

Dr. Harlan, in Journ. Acad. vol. iv. pl. xiv. fig. 2, 3, 4.

THIS Saurian, so well known by the name of Monitor, Maestricht animal &c., was once among the inhabitants of the shores of the American continent, as is proved by teeth and vertebræ found in Monmouth, Burlington and Gloucester counties, in New Jersey, and at St. Georges in Delaware.

The tooth represented on the annexed plate, was first described and figured by Dr. Harlan; since which time numerous others have been found. Mr. Mantell, to whom I sent a cast of one of them, assures me that he can perceive no difference between it and the teeth from Maestricht; and that in fact they are as much alike as if they belonged to the same species.

## GEOSAURUS.

Pl. xi. fig. 10.

In a memoir lately published,\* Dr. Dekay announces the discovery, in New Jersey, of some remains of the Geosaurus, a subgenus of Mosasaurus. I have annexed an accurate representation of two teeth, with a portion of the jaw, which have been kindly lent me for that purpose by Dr. Dekay.

## PLESIOSAURUS.?

Dr. Harlan, (Journ. Acad. Nat. Sciences, vol. iv.) describes some remains which he supposes to have belonged to this animal. They consist chiefly of vertebræ, and are preserved in the collections of the Academy. I believe the remains of Plesiosaurs have not hitherto been found in Europe in any beds more recent than the Oolites.

A recent inspection of these remains, causes me to entertain doubts of their belonging to any animal of the Saurian order.

## CROCODILE.

1. Pl. xi. fig. 12, represents a tooth, found with several others, together with a considerable portion of the jaw bone, near White Hill, N. J. in blue marl. (*Vide* Dr. Harlan's paper, in Journ. Acad. vol. iv. pl. 1.) This tooth is longitudinally striated, like those in "Tilgate Forest," pl. v. fig. 2. 9. I found a vertebra of a crocodile in the marl of St. Georges, Delaware.

\* Ann. N. York Lyceum, Vol. iii.

2. Pl. xi. fig. 13. Another tooth, from the calcareous strata at Timber creek, in Gloucester county, N. J. It differs from the preceding one in the absence of striæ. Considerable portions of the jaw, embracing several teeth, were obtained in the same beds, and are now contained in the collections of the Academy: the greater part of the skeleton yet remains; but owing to the hardness of the limestone, and the extent of the superincumbent mass, the attempts to remove it have proved fruitless.

3. Lieut. Mathers obtained from the marl near Shrewsbury, N. J., maxillary portions of a third species, which, from its elongated snout, appears to have been a *Gavial*. Vertebral bones are not unfrequent.

#### SAURODON. *Hays*.

*S. Leanus*. Hays. (Amer. Phil. Trans. vol. iii. N. S. Pl. xvi.)

Portions of the jaws of an extinct animal have been described by Dr. Hays under this name. These remains appear to be congeneric with the *Saurocephalus* of Dr. Harlan, (Journ. Acad. Nat. Sciences, vol. iv.) brought from Missouri by Messrs. Louis and Clark.

The *Saurodon* was found in the marl near Woodbury, New Jersey.

Several vertebral bones have recently been described by Mr. Rogers, in the Journal of the Academy, which he regards as indicating an extinct Saurian of far larger dimensions than any hitherto discovered. The specimens are two vertebræ from the marl near Timber creek, Jersey, and a single vertebral bone from the lower limestone

of Alabama. They approach very nearly, he conceives, to some large vertebral bones from Honfleur, figured by Cuvier, (*Ossements Fossiles*.) See Journ. of Acad. of Nat. Sc. vol. vii.

In the Academy of Natural Sciences, and in private collections in this city, are some interesting remains which appear to have belonged to Saurian animals. I possess some singular specimens figured on pl. xviii., figs. 1 and 2. At first I supposed them to be dermal bones, allied to those of the *Hylæosaurus*, as figured by Mr. Mantell; but as they possess a distinct enamel, and as some specimens are worn by attrition on the apex, they may have been the palate bones of some marine animal.

#### TESTUDO.

There are, in the Academy of Natural Sciences, several bones which appear to belong to a large species of *Testudo*.

#### PISCES.

#### SQUALUS.

Bones and teeth of various species of *shark* are abundant in this formation. They are mostly in fine preservation; and I am indebted to my friend J. P. Wetherill, Esq. for the use of several beautiful specimens in his possession. Notwithstanding the admirable perfection of these remains, I am not sufficiently acquainted with them, (excepting perhaps in two or three instances) to identify them with known species, either recent or fossil.

- S. . . . . Pl. xi. fig. 1. With an entire edge, and an appendage at each basil margin. Arenaceous beds of New Jersey.
- S. . . . . Pl. xi. fig. 2. Lanceolate, curved, longitudinally striated. New Jersey and Alabama.
- S. . . . . Pl. xi. fig. 3. Lanceolate, curved, smooth, with lateral basal appendages. New Jersey and South Carolina.
- S. . . . . Pl. xi. fig. 4. With serrated edges.
- S. . . . . Pl. xi. fig. 5. With entire edges, and basal appendages. New Jersey. Probably allied to *S. zygaena*.
- S. *Cuvieri*? Pl. xi. fig. 6. See Mantell's Geology of the South East of England, p. 132. A similar tooth is referred to *S. mustilus*, by Parkinson, *Org. Rem.* vol. iii. pl. xix. fig. 3.
- S. . . . . Pl. xi. fig. 11. Curved, with a basal appendage. New Jersey.
- S. . . . . Pl. xii. fig. 2. Compare with Parkinson, *Org. Rem.* pl. xix. fig. 11. Found in both the arenaceous and calcareous strata.
- S. . . . . Pl. xii. fig. 3. Lanceolate, with coarsely serrated edges, and obscure basal appendages. New Jersey.
- S. . . . . Pl. xii. fig. 4. Curved, with coarse marginal serrations, and large, auricular basal appendages. New Jersey.
- S. . . . . Pl. xii. fig. 5. With serrated edges. New Jersey.

Vertebral bones and teeth of the shark are also represented, Pl. 15, fig. 14, and pl. 19, fig. 11 and 13.

## SPHYRÆNA.

Pl. xii, fig. 1.

Some remains of this remarkable genus of fishes, have been found in the blue marl of Monmouth county, New Jersey. Part of a jaw, with several teeth, is in the possession of William Cooper, Esq.; and the annexed drawing of a large tooth, is from a specimen in the cabinet of the Academy of Natural Sciences.

Impressions and scales of fishes have been repeatedly observed; but the friability of the matrix in which they occur, has prevented their being carefully examined.

Masses which appear to be *Coprolites* are not unfrequent.

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A solitary tibia of a bird belonging to the genus *Scolopax*, was found in friable green marl near Arneytown, New Jersey. It is preserved in the Academy of Natural Sciences.

## ANIMALIA MOLLUSCA.

## CEPHALOPODA.

## SEPIA.

I possess several remains which correspond very nearly with the figures given by M. de Blainville of the RHYN-COLITES, supposed to be the fossil beaks of *Sepiæ*.

## NAUTILUS.

1. *N. Dekayi*, (S. G. M.) pl. viii. fig. 4, and pl. xiii, fig. 4.

*Specific character*.—Shell very ventricose, with numerous undulated, transverse striæ; aperture laterally and profoundly expanded.

From the marls of Monmouth and Burlington counties, New Jersey. This is the only species hitherto found in our marls. It has been sometimes compared to *N. expansus*, (Sowerby,) but is much larger: it has also been confounded with the British *N. imperialis*, to which, however, it bears no other resemblance than all the species of this genus bear to each other. I have much pleasure in dedicating this fossil to my friend Dr. Dekay, one of the most zealous and intelligent of American naturalists.

Mr. Read has found fragments near Long-branch, N. J., which when entire could have been little short of eight inches in diameter. The casts so abundant at Prairie Bluff, Alabama, (pl. xiii. fig. 4,) are rounder and less expanded at the mouth, than those from New Jersey, and may possibly be distinct; if so, I propose for it the name of *N. perlatus*.

2. *N. Alabamensis*, (S. G. M.) Pl. 18, fig. 3.

*Specific character*.—Shell suboval, compressed; septæ profoundly sinuous; siphuncle very large. Length 10 inches; height 9 inches; greatest diameter  $4\frac{1}{2}$  inches.

From the newer cretaceous rock, near Claiborne, Alabama.

1. *B. Americanus*. (S. G. M.) Pl. i. fig. 1, 2, 3, 3a.

Journ. Acad. Nat. Sc. vol. vi, pl. viii. fig. 1, 2, 3; Amer.

Journal of Science, vol. xviii, pl. i. fig. 1, 2, 3; Journ.

Acad. Nat. Sc., vol. vi. pl. v. fig. 7; Mitchell, Amer. ed. of

Cuvier's Theory of the Earth.

*Specific character.* Sub-cylindrical, with a slight contraction towards the base, which gently expands: base marked by numerous deep, ramose furrows, at first directed obliquely upwards, but becoming longitudinal as they approach the apex, giving the surface a coarsely granulated appearance. In the base is a fissure extending about one-fourth of the length of the shell, and communicating with a conical, subcentral chamber, marked with concentric circles. On the back is a distinctly elevated plane surface, narrow towards the base, and expanding gradually towards the apex, where it becomes indistinct. Color, clove brown; translucent.

*Var. A.* Subfusiform, Pl. i, fig. 3.

*Var. B.* Chamber small, body flattened, apex obtuse. Pl. i, fig. 3a.

*Var. C.* Slender, tapering, pointed. Pl. xvii. fig. 2.

Whether these varieties of form are specific or accidental, I will not at present attempt to decide; but when it is recollected that M. de Blainville has described nearly fifty species of European Belemnites, we may reasonably suspect that our own are not limited to a single species.

This species has an analogue in *B. mucronatus* of Europe, (Blainville, *Mem. sur les Belemnites*, pl. i. fig. 12; Sowerby, pl. 600. fig. 1, 2, 4, 6 and 7.) Abundant in the arenaceous marls of New Jersey, Delaware, North Carolina and Georgia. In some of its localities it is pro-

bable that hundreds of individuals might be collected in the compass of a few cubic feet.

In a paper published in the Journ. Acad. Nat. Science, several years ago, I referred the American Belemnites to Lamarck's species, *B. subconicus*, chiefly from an unwillingness to multiply specific names. In a later number of that work I have examined these remains with more scrutiny, and with the results here stated. Mr. Mantell, to whom I have sent specimens, agrees with me in considering the American Belemnite a new species.

2. *B. ? ambiguus*, (S. G. M.) pl. i. fig. 4, 5.

*Specific character.* Straight, elongated, quadrangular, striated longitudinally; front convex; back flat; sides slightly depressed by a longitudinal groove; apex obtuse, obscurely stellated; color yellowish white, opaque; substance, radiated carbonate of lime.

Length 2 inches; breadth 1-6th of an inch.

The specimens present some variety in the proportions of their sides, but the preceding characters will apply to most of them.

I always suspected this singular fossil to be a Belemnite, and especially after referring to the "Memoire sur les Belemnites" of M. de Blainville. The *B. cylindricus* of that author appears to be the analogue of the American species; the latter differing chiefly in the distinctness of its lateral grooves. It is observed of the *B. cylindricus*, that it has rarely been observed with any trace of either a chamber or terminal extremity. My specimen shows the latter, but not the former; and the numerous individuals in the collections of the Academy are destitute of both.

Nevertheless I am by no means certain that this fossil is a Belemnite, and Mr. Mantell has examined it without coming to a decision.

From the calcareous strata of New Jersey, especially on Timber creek, Gloucester county.

M. de Blainville makes the following remarks on the Geological position of Belemnites:

“Jusqu'ici, leur presence est presque caracteristique des terrains secondaires, ou des formations qui se trouvent entre les terrains intermediaires, et les terrains tertiaires superieurs a la Craie. Je ne connais, en effet, presque aucun auteur qui indique les Belemnites veritables dans les differens strates du terrain de transition, non plus que dans les terrains de sediment superieurs a la craie.”\*

The author then states, on the authority of Mr. Underwood, that Belemnites have never been found in the London clay, as some have asserted. Conybeare and Phillips make a similar observation.

#### AMMONITES.

1. *A. placenta*, (Dekay,) pl. ii. fig. 1, 2.

Ann. N. York Lyc. Nat. Hist. vol. ii. pl. v. fig. 2; Journ. Acad. Nat. Science, vol. vi. pp. 88, 112, 195; Am. Journ. Science, vol. xviii. pl. ii. fig. 1, 2, 3.

*Specific character.* Discoidal, with three or four broad, compressed whorls, tapering towards each edge; one half the whorl being embraced and concealed by the contiguous one; inner whorls having slight transverse elevations, tuberculated at their inner margins; septæ on the surface, numerous, multi-lobed, sigmoid.

\* Memoire sur les Belemnites, p. 48.

This species (the largest hitherto observed in America) was described by Dr. Dekay from a fragment, in the second volume of the "Annals of the New York Lyceum of Natural History." By some unaccountable mistake the description there given refers to the wrong figure in the accompanying plate: thus, fig. 2 of plate v. is the *A. placenta*, whereas the text refers to fig. 5, which is in reality the *A. hippocrepis*: this unfortunate error led me into the mistake of calling the former species by the latter name; as will be seen in my papers in the Journal of the Academy, vol. vi. pp. 88 and 113, and pl. v. fig. 4. My description and drawing in that work, therefore, refer to *A. placenta*.

Great numbers of this fossil were found in excavating the deep cut of the Chesapeake and Delaware canal. A fine specimen, about fifteen inches in diameter, has been deposited in the collections of the Academy, by Mr. Hugh Lee: and the same gentleman has presented another to the American Philosophical Society, eighteen inches in diameter. It has also been found in many parts of New Jersey; sometimes with portions of the shell remaining. A similar specimen is contained in the collections of the Academy, from the southern bend of the Tennessee river.

2. *A. Delawareensis*, (S. G. M.) pl. ii. fig. 5.

American Journal of Science, vol. xviii. pl. ii. fig. 4.

*Specific character.* Volutions uncertain; each whorl furnished with elevated transverse ridges, which bifurcate about half way across, and terminate in prominent tubercles on the

margin; ridges marked by three or four conspicuous nodes; back between the tubercles convex.

Probable diameter from 8 to 12 inches.

The annexed drawing is from a specimen obtained at the Delaware and Chesapeake canal, in the Ferruginous sand. I have another from Alabama.

3. *A. Vanuxemi*, (S. G. M.) pl. ii. fig. 3, 4.

American Journal of Science, vol. xviii. pl. iii. fig. 3, 4.

*Specific character.* Whorls depressed, sub-convex, with numerous slightly curved, tuberculated ribs; back marked with a single, prominent, central ridge, on each side of which the terminations of the costæ form distinct, angular prominences.

Supposed diameter, 3 inches; thickness,  $\frac{5}{8}$ ths of an inch.

Found at the Chesapeake and Delaware canal. Hitherto fragments only have been obtained, the most perfect of which is figured on the annexed plate. Larger specimens have been found.

I have much pleasure in dedicating this species to my friend Mr. Lardner Vanuxem.

This may prove a turritid shell, in which case it will of course be transferred to the genus *Turrillites*.

4. *A. telifer*, (S. G. M.) pl. ii. fig. 7.

Imperfect as are the remains of this fossil, they indicate a species so different from the others, that I venture to give it a name. The arrangement of the septa reminds us of the ammonite of Maestricht, figured by Faujas, pl. xxxi.

In the former edition of this synopsis, I admitted the *Ammonites hippocrepis* of DeKay: I have lately, through the kindness of that gentleman, examined his specimen, and find it to be a transverse fragment of *Scaphites Cuvieri*.

5. *A. Conradi*. (S. G. M.) pl. 16, fig. 1, 2, 3, and pl. 19, fig. 4.

*Specific character.* Much compressed; one complete volution and part of a second, the smaller being received into and concealed by the larger: five or six rows of tubercles on each side, the outer ones terminating at the peripheral margin, the inner ones at the internal margin of the whorl; tubercles united by sub-angular, slightly curved costæ. Periphery sub-convex, and marked with three or four delicate, longitudinal lines. Septæ innumerable, extremely tortuous and intricate. Largest diameter nearly two inches. Thickness half an inch. Pl. xvi. fig. iii.

I dedicate this species, the most beautiful fossil hitherto found in this formation, to its discoverer, my estimable friend T. A. Conrad, Esq. Mr. C. found it abundantly at Prairie Bluff, Alabama, in the older cretaceous deposits. So variable, however, are its forms that I was at first disposed to consider myself in possession of three distinct species, which however, upon a comparison of upwards of fifty individuals, appear to have their essential characters, in common. The most remarkable of these varieties are the following.

*Variety A.* Pl. xvi. fig. ii.

More ventricose, outer tubercles larger, inner ones almost obsolete: costæ more distant, and larger. I had proposed for this fossil the name of *A. gulosus*, which will serve should it not prove identical with the former.

*Variety B.* Pl. xvi. fig. i.

Ventricose; costæ and tubercles remarkably distinct. This shell at first sight resembles an *Argonauta*, but it is a true *Am-*

monite. If it be not identical with the preceding species, I propose the name of *A. petechialis*.

*Variety C.* Pl. xix. fig. 4.

Elongated like a scaphite, the whorls being more distinct, and less in diameter, than in any one of the preceding varieties.

At first I pronounced it a Scaphite, but it appears to glide by degrees into the *A. Conradi*. If it be not the same, it may be called *A. navicularis*. That it is not a Scaphite, but an accidentally elongated Ammonite, I am entirely certain. I have one fragment of *A. Conradi*, which must have been upwards of four inches in diameter.

6. *A. syrtalis*. (S. G. M.) Pl. <sup>16</sup>(xiv) fig. iv.

*Specific Character.* Shell much compressed, but widening rapidly towards the aperture; two series of nodes, one on the umbilical margin, the other near the periphery; nodes but little elevated, except on the umbilical margin, near the aperture, where they are profoundly elevated: periphery with two series of pyramidal nodules, giving it a dentated appearance; septæ distant, sigmoidal. Greatest diameter about three inches.

From the older cretaceous deposits of Greene county, Alabama.

7. *A. vespertinus*. (S. G. M.) Pl. xvii. fig. i.

*Specific Character.* Volutions uncertain; each whorl furnished with profoundly elevated transverse ridges, with three slight nodes on each; that on the margin most prominent.

Length of the fragment  $13\frac{1}{2}$  inches.

My friend Dr. Z. Pitcher, of the United States' army, has presented me with several large fragments of this Ammonite, from the plains of Kiamesha, in Arkansaw; where

it is accompanied by *GRYPHÆA vomer*, G. *Pitcheri* and *EXOGYRA costata*. It is allied to *A. Delawarensis*, but differs in the absence of bifurcations in the costæ.

### SCAPHITES, Parkinson.

*S. hippocrepis*,  
*S. Cuvieri*, (S. G. M.) } Pl. vii. fig. 1.

*AMMONITES hippocrepis*, (Dekay.)

Annals of the New York Lyceum, vol. ii. pl. v. fig. 5.

*Specific character.* *Larger whorl* ventricose, with eight prominent lateral tubercles, and two others more elevated at the inner margin on each side; back delicately ribbed between the lateral tubercles; an obscure ridge from each of the latter to the umbilical margin; no visible septa; *smaller whorl* compressed, half concealed, costated all round; septa numerous, serrated like those of an Ammonite.\*

Diameter of larger whorl, an inch and a half.

Diameter of smaller whorl, an inch and an eighth.

This beautiful specimen is a black sub-siliceous cast: it was found about sixty feet below the surface, at the deep cut of the Chesapeake and Delaware canal, in an argillo-ferruginous sand.

This fossil was obligingly presented to me by my friend Mr. Wm. L. Newbold, to whom I am under many similar obligations.

Dr. Dekay first described this fossil from an imperfect fragment, and called it *AMMONITES hippocrepis*. Several years afterwards, I satisfied Dr. Dekay that we had

\* *S. anfractu majori* ventricosus, tuberculis octo in utroque latere, cum duobus alteris prope marginem internam; dorso pulchre costato inter tuberculas: *anfractu minori* compresso, costato, semi occultato; septis serratis.

given different names to the same species; but as his has priority, I of course abandon mine.

2. *S. reniformis*, (S. G. M.) pl. ii. fig. 6.

*Specific character.* Ventricose in the middle, tapering rapidly towards each end; with numerous costæ that bifurcate laterally.

Less than inch in length.

A solitary and imperfect cast was found by Mr. Conrad in the friable marl at Grove mill, near Bordentown, N. J.

Allied to *S. striatus* of the British chalk.

BACULITES. *Faujas*.

1. *B. ovatus*, (Say,) pl. i. fig. 6, 7, 8.

Journ. Acad. Nat. Sciences, vol. vi. pl. v. fig. 5, 6. Amer.

Journ. of Science, vol. xviii. pl. i. fig. 6, 7, 8.

*Specific character.* Transversely suboval, with semi-elliptical lateral undulations; septa six-lobed, and a smaller one behind; lobes of the superior faces of the septa three on each side, with a minute one between each, dentated at their edges: *anterior lobe*, (nearest the siphunculus,) small, not sinuous; *second lobe* with a single projection at each side, and sinus at the tip; *third lobe* dilated, with a small sinus at each side, and a more profuse and profound one at tip; posterior lobe scarcely larger than the lateral intermediate ones.

The above description is derived from Mr. Say, excepting the undulatory sides, which is obvious in all the more perfect specimens I have seen, as in fig. vi. of pl. i. In other instances, (Pl. i. fig. viii.) these undulations are scarcely perceptible, owing probably to attrition. Such is the case with the original specimen described by Mr.

Say, which I have figured in Journ. Acad. Nat. Science, vol. vi. pl. v. fig. 6.

The greatest diameter of one of my specimens is an inch and three-fourths; and they have been found five inches long. It is not uncommon in New Jersey, and occurs also in the Ferruginous sand of Delaware and Alabama.

2. *B. compressus*, (Say,) pl. ix. fig. 1.

American Journal of Science, vol. ii, p. 41.

*Specific character.* "Elongated, much compressed; transverse section oblong-oval, narrowed to each end; lobes dilated, dentated on their edges, with from three to five sutures on each side, and a profound one at tip."

Mr. Nuttall informed Mr. Say that this fossil is of frequent occurrence in the Missouri country, washed out from the banks of the Missouri river, between White river and the Mandan settlements. Mr. N. has seen them more than a foot long, and three or four inches broad at base.

I regret that I have seen so few specimens of this fossil as not to have satisfied myself that it is distinct from *B. ovatus*. The name *compressus* given it by Mr. Say is sufficiently descriptive, as will be seen by reference to the accompanying figure, which was drawn from a specimen lent me by J. P. Wetherill, Esq.

3. *B. asper*, (S. G. M.) pl. i, fig. 12, 13, and pl. xiii, fig. 2.

*Specific character.* Transversely suboval, with prominent circumscribed, lateral nodes, and numerous septa.

This species is immediately recognized by its tubercles, which are unconnected with undulations. It was discovered by Mr. Nuttall, at Cahawba, Alabama, and more recently by Mr. Conrad at Prairie Bluff, in that state.

4. *B. columna*, (S. G. M.) pl. xix, fig. 8.

*Specific character.* Transversely subovate, with numerous, distant, arched ribs, which can be traced round the entire periphery, but are most distant at the sides.

Diameter, half an inch.

From Prairie Bluff, Alabama. Found by Mr. Conrad.

5. *B. carinatus*, (S. G. M.) pl. xiii, fig. 1.

*Specific character.* Transversely subcuneiform, the siphuncular margin being distinctly carinated. Sides with distinct, oblique, equidistant, arched ribs.

From Prairie Bluff, Alabama, where it was found in considerable numbers by Mr. Conrad.

6. *B. labyrinthicus*, (S. G. M.) pl. xiii, fig. 10.

*Specific character.* Shell with two series of distant nodes, nearly parallel; posterior series marginal, the anterior series in the middle; diameter subpentagonal; back flattened; anterior side cuneiform; septa profoundly sinuous, crowded.

Found by Mr. Conrad, at Prairie Bluff, Alabama.

#### HAMITES.

1. *H. arculus*, (S. G. M.) pl. xv. fig. 1 and 2.

*Specific character.* Transversely suboval, compressed, with very distant, profoundly elevated, pyramidal nodes, and intermediate smaller ones near the anterior edge; nodes slightly curved; septa close, and profoundly sinuous.

*Var. A.* With numerous curved ridges instead of nodes, which meet at an acute angle on the anterior margin.

From the older cretaceous strata of Greene county, Alabama. Mr. T. A. Conrad.

2. *H. torquatus*, (S. G. M.) pl. xv. fig. 4.

*Specific character.* Transversely suboval or orbicular, with rather distant, profoundly elevated, acute,\* oblique costæ, the intervening spaces being regularly concave.

Diameter half to three-fourths of an inch.

This fossil much resembles a screw.

From the older cretaceous deposits of Greene county, Alabama. Mr. T. A. Conrad.

3. *H. trabeatus*, (S. G. M.) pl. xv, fig. 3.

*Specific character.* Transversely oval, with numerous curved or arched undulations.

Diameter, half an inch.

From the older cretaceous strata at Prairie Bluff, Alabama. Mr. T. A. Conrad.

#### NUMMULITES.

*N. Mantelli*, (S. G. M.) pl. v, fig. 9.

*Specific character.* Discoidal, flattened, thin, tapering from the centre to the margin which is sharp; on each side a central, pustuloid elevation.

Diameter from half an inch to an inch and a half.

Innumerable in white, loose-grained limestone, near Claiborne, Alabama. (Newer cretaceous stratum.)

\* In the annexed plate this character is not well shown, owing to the specimen having been rubbed on the angles. I have now a perfect individual, from which I describe the species.

I have much pleasure in dedicating this only known American species of Nummulites, to one of the most ardent and successful cultivators of geological science, Gideon Mantell, Esq., of Brighton, England.

### GASTEROPODA.

#### BULLA.

1. Casts not very unlike *B. lignaria*. From New Jersey.

2. A solitary cast of a large, ventricose species, was found by Mr. Conrad in Alabama.

#### TROCHUS.

1. *T. leprosus*, (S. G. M.) pl. xv. fig. 6.

*Specific character.* Compressed; spire composed of about four volutions, presenting an unequal, rugged surface.

Diameter, from an inch to an inch and a half.

From Prairie Bluff, Alabama. T. A. Conrad.

This species has considerable resemblance to *T. agglutinans*, a recent shell of the West Indies.

2. I have observed some casts of this genus in the calcareous strata of New Jersey.

#### DELPHINULA.

2. *D. lapidosa*, (S. G. M.) pl. xix, fig. 7.

*Specific character.* Shell discoidal, with about three volutions; shoulder angulated; margin flattened; umbilicus profoundly patulous; spire slightly elevated above the body whorl.

From Prairie Bluff, Alabama.

2. Mr. Nuttall found a cast at Cahawba, Alabama, which seems to belong to this genus, yet has considerable resemblance to *Euomphalus*.

#### TURRITELLA.

1. *T. vertebroides*, (S. G. M.) Pl. iii, fig. 13.

*Specific character.* Turrited, subulate; volutions about five, rounded, with fine spiral striæ, and about five elevated spiral ribs on each whorl.

Length, two inches.

From New Jersey and Alabama.

2. *T. encrinoides*. Pl. iii, fig. 7.

Of this fossil I have met with several fragments, yet scarcely perfect enough for description. I have figured one of them, to show the difference between this and the former species, as the two occur in the same strata.

#### SCALARIA.

*S. Sillimani*, (S. G. M.) Pl. xiii, fig. 9.

*Specific character.* Shell turrited; volutions contiguous, rounded, with very prominent, reflected costæ, and very minute spiral striæ; body whorl carinated near the base.

Length, nearly one inch.

From Prairie Bluff, Alabama.

I dedicate this rare and beautiful species to my friend Professor Silliman, of Yale College.

1. *S. annulata*, (S. G. M.) Pl. iii, fig. 10.

*Specific character.* Volutions about five, convex and prominent, with delicate transverse striæ, which are decussated by from twenty to thirty oblique, elevated, longitudinal ribs.

Length, one inch and a quarter.

From the calcareous strata of Gloucester, New Jersey.

#### ROSTELLARIA.

1. *R. arenarum*, (S. G. M.) Pl. v, fig. 8.

*Specific character.* Whorls four or five, with elevated, longitudinal costæ, and broad, concave, intervening spaces.

Length, about an inch and a half.

A variable species, casts of which are common throughout the blue marls.

2. *R. pennata*, (S. G. M.) Pl. xix. fig. 9.

*Specific character.* Shell elevated, with about six convex volutions, and with obscure, oblique, longitudinal costæ or undulations; body whorl ventricose; labrum expanded, sinuous.

From Prairie Bluff, Alabama.

3. I have some casts of a smaller and very distinct species from Delaware.

#### TORNITELLA.

1. *T. ? bullata*, (S. G. M.) Pl. v. fig. 3.

*Specific character.* Ovoidal, ventricose, with numerous transverse striæ.

Length, about one inch.

From the marl of New Jersey.

2. Casts of a smooth species, much smaller than the preceding, occur with it.

#### NATICA.

1. *N. petrosa*, (S. G. M.) Pl. xix. fig. 6.

*Specific character.* Shell depressed, convex above; whorls four, rounded; suture indented; umbilicus very patulous.

Diameter, an inch and one-fourth.

From Prairie Bluff, Alabama.

2. *N. abyssina*, (S. G. M.) Pl. xiii. fig. 13.

*Specific character.* Shell with a flattened spire; suture channelled; body whorl large, obtusely rounded; umbilicus patulous; aperture not expanded, longitudinally elliptical.

Diameter, three-fourths of an inch.

From Prairie Bluff, Alabama.

CIRRUS.

*C. crotaloides*, (S. G. M.) Pl. xix, fig. 5.

*Specific character.* Shell with four or five rounded volutions, much excavated at the sutures; spire convex; the two first whorls suddenly produced.

Mr. Conrad found a single specimen at Erie, Alabama, in the older cretaceous deposits.

CONUS.

*C. gyratus*, (S. G. M.) Pl. x, fig. 13.

*Specific character.* Spire elevated, with about five prominent volutions.

Length, one inch.

Of this species I possess a solitary cast, from the calcareous beds of South Carolina. I name and figure it on account of its being the first and only appearance of this genus in the strata now under consideration. It was found by Mr. Conrad.

## CYPRÆA, Lin.

A solitary cast of a very small species was found in the strata of the Chesapeake and Delaware canal, and was shown me by Mr. John Finch.

## PATELLA, Lam.

*P. tentorium*, (S. G. M.) Pl. i, fig. 11.

*Specific character.* Depressed, orbicular, with about eighty costiform striæ, radiating from the apex to the margin.

Diameter, rather more than half an inch.

This fossil has some appearance of a shelly operculum, in which case it would belong to the genus *Hipponix*.

I have met with but a solitary individual, which was obtained by Mr. Conrad in blue marl, near Arneytown, New Jersey.

## ACEPHALA.

## OSTREA, Lam.

1. *O. falcata*, (S. G. M.) Pl. iii. fig. 5, and pl. ix, fig. 6, 7.

Journ. Acad. Nat. Sciences, vol. vi. pl. i. fig. 2.

*Specific character.* Falciform, auriculated, thin, depressed; six or seven deep plications commence near the beaks, and terminate at the margin.

Length, from half an inch to an inch and three-fourths.

A characteristic fossil of this formation; abundant at St. Georges, Delaware. Mr. Nuttall found it at Cahawba, Alabama. It is also very abundant at Prairie Bluff, on the Alabama river.

*Var. A.* Pl. ix, fig. 6. Smooth, expanded, compressed; with three or four strong marginal plications.

This shell in outline resembles the former, but is in other respects so different, that I am almost disposed to consider it specifically distinct; should further comparisons prove it to be so, I propose the name of *O. nasuta*.

*Var. B.* Pl. ix, fig. 7. Smooth, contracted; upper valve convex; lower valve flat; with about seven strong marginal plications. Inner margin crenulated.

So different in its characters from both the preceding shells, that were it not found with them I should not hesitate to consider it a distinct species: should it hereafter prove to be so, it may be designated *O. mesenterica*.

My specimens were chiefly obtained in the arenaceous marls near Shrewsbury, New Jersey.

2. *O. plumosa*, (S. G. M.) Pl. iii, fig. 9.

*Specific character.* Ovato-triangular, thin; lower valve convex, crenated near the hinge; dorsum marked with delicate striæ, radiating in fasciculi from the beak to the margin.

Length, about an inch and a half.

From the blue marl of Arneytown, New Jersey.

I possess a single valve of an old specimen, in which the striæ are nearly obsolete.

3. *O. panda*, (S. G. M.) Pl. iii, fig. 6, and pl. xix, fig. 10.

*Specific character.* Surface irregularly costate or undulated, plaited at the margin; with an irregular gibbosity, sometimes at the side, in others in the centre of the shell.

The gibbosity of this species is very remarkable:

but it is very inconstant, and sometimes absent. Referred in the former edition to *O. cristagalli*.

Chiefly found at St. George's, Delaware, and since in South Carolina and Alabama, where it is one of the most characteristic fossils of the newer cretaceous strata.

4. *O. tarosa*, (S. G. M.) Pl. x, fig. 1.

*Specific character.* Elongated, with strong, squamous longitudinal costæ, intersected by transverse ridges.

Length, five inches; breadth, three inches.

The squamous disposition of the costæ, gives this shell a coarsely reticulated aspect. I found at Mullica Hill, New Jersey, a solitary individual, replaced by siliceous matter.

5. *O. sellæformis*, (Conrad, *Fossil Shells* &c. Pl. xiii.)

Mr. Conrad has ascertained that the *O. radians* is the superior valve of the present species, which occurs not only in the Eocene at Claiborne, Alabama, but also in the newer cretaceous strata in South Carolina.

6. *O. cretacea*, (S. G. M.) Pl. xix. fig. 3.

*Specific character.* Shell obovate, convex; obscurely rayed; superior valve slightly convex; cardinal fosset broad; beak scarcely prominent.

Common in the older cretaceous strata of Greene county, Alabama. This species is very abundant in the bluff at Erie, where it constitutes a distinct stratum. It is also common in the calcareous strata of South Carolina.

## GRYPHÆA, Sowerby.

1. *G. convexa*, (Say.) Pl. iv, fig. 1, 2.

Journ. Acad. Nat. Sciences, vol. vi, pl. iv. fig. 1, 2, and pl. v, fig. 1, 2, 3.

*Syn. OSTREA convexa*, (Say.)

American Journal of Science, vol. ii, p. 42.

*Specific character.* Oblong oval, smooth: upper valve thin, very concave, concentrically striated; margin reflected abruptly upwards to meet that of its fellow: lower valve remarkably convex, smooth, biangulated from the hinge margin, with a longitudinal indented line on one side; a transversely wrinkled groove within on each side of the hinge; cicatrix oval; beak broad, plane, remarkably incurved; umbo not prominent.

Length, two inches and three quarters; breadth, two inches and a quarter; depth, an inch and a quarter.

*Var. A.* Umbo thick and prominent. Journ. Acad. vol. vi. pl. v, fig. 1, 2 and 3.

*Var. B.* Elongated.

Abundant in the arenaceous marls of New Jersey, Delaware and Alabama.

2. *G. mutabilis*, (S. G. M.) pl. iv, fig. 3.

Journ. Acad. Nat. Sciences, vol. vi, pl. iv, fig. 3.

*Specific character.* Suborbicular, smooth, broadly expanded each side of the beak; both valves obliquely corrugated each side of the hinge: upper valve slightly concave, concentrically striated, outer edge reflected obliquely upwards to the disc of its fellow, with a few lines radiating from the apex to the periphery: lower valve convex, transversely undulated, lobed by a longitudinal groove; cicatrix subovate; umbo prominent; beak slightly incurved.

Length, four inches; breadth, four inches and a half.

*Var. A.* Upper valve subconvex, umbo depressed.

This interesting fossil expands laterally from the hinge on each side, but most on that which is lobed. The radiated lines on the upper valve are few in number and irregular, but in most instances strongly marked. The lower valve has a ridge or line extending from the hinge round the shell, and parallel to the edge: at this point the reflected margin of the upper valve commences, and is continued obliquely upwards to the disc of the corresponding valve. Some individuals are attached by the beak, like *PODOPSIS gryphæoides*. Some varieties are so like *OSTREA vesicularis*, Lam., as scarcely to be distinguished from it. The *O. vesicularis* is characteristic of the European chalk. Others approximate to *GRYPHÆA bullata*, Sowerby, pl. cccxviii. Faujas de St. Fond figures a shell very similar to ours from the plateau of Maestricht.

The protean forms of the two preceding species, have puzzled most naturalists who have examined them; and although I have at different times possessed more than an hundred individuals, I not unfrequently meet with intermediate varieties that may as readily be referred to one species as the other. It is even possible that they all belong to a single species.

Accompanies the preceding species, and is found as far west as Tennessee and Missouri.

3. *G. vomer*, (S. G. M.) Pl. ix. fig. 5.

*Specific character.* Oblong-oval, thin, narrow; lower valve deep, longitudinally curved; beak prominent, curved laterally;

upper valve small in proportion to the lower, and marked with distinct, concentric, squamous plates.

Length, from one to two or three inches.

Occurs chiefly in the arenaceous strata at Egypt, New Jersey; many individuals usually adhering by the beaks. It is also found in the calcareous beds.

The shell figured in the Journ. Acad. Nat. Sciences, vol. vi. pl. v, fig. 1, 2 and 3, under the name of *G. vomer*, is a variety of *G. convexa*, and was introduced there by mistake.

The *G. vomer* is one of the most characteristic fossils of the American cretaceous strata, occurring abundantly both in the calcareous and arenaceous beds.

4. *G. Pitcheri*, (S. G. M.) Pl. xv, fig. 9.

*Specific character.* Shell thick, expanded, distinctly lobed; lower valve very convex; upper valve thick and sub-convex; beak distinctly incurved.

Length, one inch; but I possess less perfect specimens nearly three inches long.

I received this fossil, together with some others of great interest, from my friend Z. Pitcher, M. D., of the U. States' army, who obtained it from the plains of the Kiamesha, in Arkansas. I have seen others from the falls of Verdigris river, in the same territory.

The *G. plicatella*, published by me in the American Journal of Science, proves to be a variety of *G. vomer*.

EXOZYRA, Say.

*E. costata*, (Say.) Pl. vi, fig. 1, 2, 3, 4.

Amer. Journ. Science and Arts, vol. ii, p. 43.

*Specific character.* Sub-oval, thick; lower valve convex,

costated, transversely corrugated, costæ of the disc somewhat dichotomous, sometimes fornicated; apex lateral, with about two volutions; a single profound cicatrix; hinge with two nearly parallel, deeply excavated grooves, of which the inner one is shortest and corrugated: upper valve flat, with numerous elevated, concentric, squamous plates; outer edge abruptly reflected from the inferior to the superior surface; hinge with a single groove on the edge.

*Var. A.* Smooth.

Varies in size from an inch to ten inches in length.

Abundant in almost all the arenaceous marls of this series. New Jersey, Delaware, South Carolina, Alabama, Tennessee and Arkansas, possess numerous localities.

Mr. Say is certainly correct in making a distinct genus of this fossil, in proof of which it will be found that Mr. Sowerby has placed a congeneric shell with *Chama*, (*C. conica*,) while M. Brongniart classes another with *Gryphæa*, (*G. auricularis*.\*) The true *Exogyra* has but a single muscular impression in each valve, which sufficiently distinguishes it from *Chama*, while it differs still more strongly from *Gryphæa*. It is an interesting fact, that all those European fossils which belong to the genus *Exogyra*, have been found exclusively in acknowledged secondary deposits. Thus the *CHAMA conica* and *C. haliotoidea*, of Sowerby, are peculiar to the green sand of England, while the *GRYPHÆA auricularis* of Brongniart has been found, in France, only in chalk marl.†

\* Geol. des Environs de Paris, pl. vi. fig. 9.

† By reference to the "Mineral Conchology of Great Britain," (a work to which I am under great obligations,) No. 104, it will be seen that Mr. Sowerby has adopted Mr. Say's genus *Exogyra*, and transfers to it five fossil shells, (all

## PECTEN.

1. *P. quinquecostatus*, (Sowerby.) Pl. xix. fig. 1.

This fossil is beyond a doubt specifically identical with the one described by Sowerby, and so characteristic of the cretaceous strata of Europe. I first detected it from casts,\* but am now in possession of several shells, which answer in every particular to the figures of Sowerby and Brongniart. The last named naturalist makes the following remark on this species:—"Ce peigne qui paraît présenté des variétés asses nombreuses de dimensions, et même de proportions dans les dimensions, est une des coquilles les plus constantes dans les terrains de craie inférieurs."

2. *P. craticula*, (S. G. M.)

*Specific character.* Suborbicular, unequal, with about ten large, elevated, convex, longitudinally striated ribs, and a smaller one interposed between each pair.

Length, about an inch and a half.

Of this rare and remarkable species I have not seen an

found in or below the chalk formation,) which he had originally placed under the genus *Chama*. Among these are *CHAMA haliotoidea* and *C. conica*, which I had indicated as belonging to Mr. Say's genus.

Mr. Sowerby suggests that the *EXOGYRA costata* and *E. haliotoidea* may be identical. I have examined many specimens of each, and although they appear to be analogues, they are obviously distinct species.

Mr. Sowerby also thinks the American *GRYPHÆA convexa* to be the European *G. globosa*. In this opinion I have to differ from him, and am supported by Mr. Mantell, to whom I have sent numerous individuals of the American fossil.

\* American Journal of Science, vol. xviii, pl. iii, fig. 5. •

entire specimen, nor, indeed, one sufficiently perfect to figure. It was found near Arneytown, New Jersey, by Mr. Conrad.

3. *P. venustus*, (S. G. M.) Pl. v, fig. 7.

*Specific character.* Orbicular, thin, depressed, with fifteen or twenty double costæ, those on the lower valve delicately beaded.

Diameter, about half an inch.

Found with the preceding species.

4. *P. anatipes*, (S. G. M.) Pl. v, fig. 4.

*Specific character.* Suborbicular, flattened, with four broad, convex ribs, longitudinally striated; at the sides larger striæ replace the ribs.

Diameter, more than half an inch.

I have seen but one imperfect individual of this species, which is figured on the annexed plate; it was obtained from a mass of Nummulite limestone, from Claiborne, Alabama.

5. *P. perplanus*, (S. G. M.) Pl. v, fig. 5, and pl. xv, fig. 8.

*Specific character.* Orbicular, somewhat flattened, with about twenty small, simple costæ, transversely striated.

Diameter, from three-fourths of an inch to an inch and a quarter.

Occurs with the preceding species.

6. *P. calvatus*, (S. G. M.) Pl. x, fig. 3.

*Specific character.* Orbicular, depressed, smooth, thin, with a few obsolete radiating lines.

Diameter three-fourths of an inch.

Very distinct from any of the preceding species. Found by Mr. Conrad in the calcareous strata, near the Eutaw Springs, South Carolina.

7. *P. membranosus*, (S. G. M.) Pl. x, fig. 4.

*Specific character.* Orbicular, convex, somewhat gibbous in the centre, with about eighty distinct costæ, the alternate ones being smaller.

Found by Mr. Conrad in the calcareous strata of South Carolina, where it is abundant.

8. *P. Poulsoni*, (S. G. M.) Pl. xix, fig. 2.

*Specific character.* Suborbicular; superior valve flat; ribs fourteen, not profoundly elevated, with crowded wrinkled striæ; inferior valve ventricose, with prominent rounded ribs, the intervals striated; ears subequal.

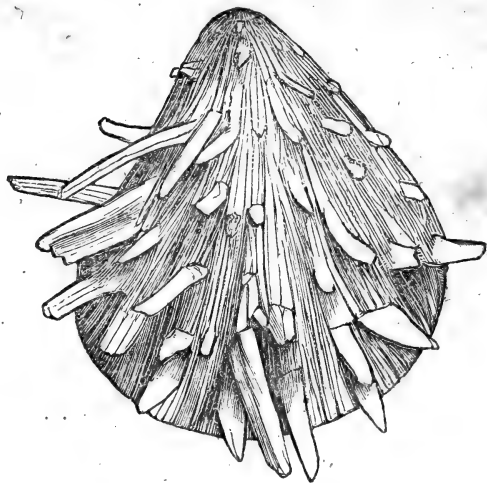
Common in the newer cretaceous deposits near Claiborne, Alabama.

I have much pleasure in naming this shell after my friend Charles A. Poulson, Esq., of this city.

PLAGIOSTOMA.

1. *P. dumosum*, (S. G. M.) Pl. xvi, fig. 8.

*Specific character.* Shell obovate, slightly ventricose, with nine or ten slightly elevated ribs, armed with long spines on each valve; spines flattened, and with a longitudinal groove beneath; intervals beneath the ribs, with two or three slightly prominent longitudinal lines.



The annexed cut represents the most perfect specimen, of the natural size: but the largest measures, from beak to base, three inches; from anterior to posterior margins, two inches and a half, and was associated with numbers of nearly the same size in a mass of limestone. Mr. Conrad observed a stratum of this species, in company with *OSTREA panda*, near low water mark, in the interesting bluff at St. Stephens, on the Tombeckbe; and it is a characteristic species of the newer cretaceous deposits of the southern states.

It has considerable general resemblance to *P. spinosum* of Sowerby; but differs from the latter in having spines on *each valve*, those on *P. spinosum* being confined to the upper valve, as is beautifully illustrated in Cuvier and Brongniart's *Geologie des Environs de Paris*, pl. iv, fig. 2.

2. *P. gregale*, (S. G. M.) Pl. v, fig. 6.

*Specific character.* Suboval, thin, especially near the beaks;

back covered with elevated, concentric squamous plates; within, marked with numerous obsolete, longitudinal striæ.

Length, from one to four inches.

This species is almost invariably attached to other shells, particularly to *Gryphæa*: the dorsum is often entirely concealed by this circumstance, but the internal striæ are so characteristic as to identify the species.

Found by Mr. Conrad in the marls of Burlington county, New Jersey.

3. *P. pelagicum*, (S. G. M.) Pl. v, fig. 2.

*Specific character.* Suboval, convex, with twenty-five or thirty narrow, elevated ribs.

Length, about an inch.

This species, unlike the preceding, has never been found attached. Its general aspect is much like that of *P. duplicata*, Sowerby, pl. clix, fig. 3, an Oolitic fossil.

ANOMIA, Lam.

1. *A. argentaria*, (S. G. M.) Pl. v, fig. 10.

*Specific character.* Discoidal, thin, with numerous delicate, concentric striæ.

From St. Georges, Delaware &c.

2. *A. tellinoides*, (S. G. M.) Pl. v, fig. 11.

*Specific character.* Irregular or suboval, with concentric undulations.

Common in the marls of New Jersey &c.

This species has the external aspect of *Tellina*; it is much thicker than the preceding one. In the former edition I referred it to *A. ephippium*, from which it is obviously distinct.

## PLACUNA, Lam.

*P. scabra* (S. G. M.)

*Specific character.* With numerous beaded costæ, radiating from the hinge to the margin; shell thin, suborbicular, compressed.

From one inch to three inches in diameter.

Found hitherto only in fragments in the blue marls.

## PLICATULA, Lam.

*P. urticosa*, (S. G. M.) Pl. x, fig. 2.

American Journal of Science, vol. xxiv, pl. x, fig. 2.

*Specific character.* Irregularly oval, flattened, thin, gregarious; with fifteen or twenty squamous costæ, some of which bifurcate near the margin.

Length, an inch and a half; breadth, an inch.

Found in the arenaceous marls of New Jersey and Alabama, by Mr. Conrad.

Referred in the former edition to *Ostrea*.

## INOCERAMUS.

1. *I. Barabini*, (S. G. M.) Pl. xvii, fig. 3, and pl. xiii, fig. 11.

*Specific character.* Obliquely elliptical, not ventricose, with concentric, prominent, subacute ribs: beaks prominent, approximate.

This species is extremely variable both in outline and size. Pl. xvii, fig. 3, represents an imperfect specimen of a large size; and pl. xiii, fig. 11, shows another much smaller, but with a nearly entire margin. From the older cretaceous strata of Greene county, Alabama.

I name this species in memory of the many favors I have received from my friend Joseph Barabino, Esq., of New Orleans.

2. *I. alveatus*, (S. G. M.) Pl. xvii, fig. 4.

*Specific character.* Ventricose, with prominent concentric ribs, and a profound and broad longitudinal sulcus on the posterior side; between this and the extremity is a similar indentation.

This species is found with the preceding, and is almost as variable. The annexed drawing was made from a small but admirably preserved specimen; but I have one in my possession three inches long.

AVICULA.

1. *A. laripes*, (S. G. M.) Pl. xvii, fig. 5.

*Specific character.* Ovato-triangular, with about twenty narrow costæ, which become gibbous towards the margin.

Length, one inch and a half.

2. A very oblique, ventricose, obscurely striated cast, less than inch in length.

Both these fossils are from the marls of Delaware.

PINNA.

Fragments of casts not unlike *P. tetragona*, Min. Conch. pl. cccxiii, fig. 1. I also obtained fragments of the shell of another species from the calcareous strata of New Jersey, and Mr. Conrad found others in Alabama.

## PECTUNCULUS.

1. *P. hamula*, (S. G. M.) Pl. xv, fig. 7.

*Specific character.* Subglobose, smooth and ponderous; posterior extremity angulated.

Diameter, from three-fourths of an inch to an inch.

Found by Mr. Conrad in the older cretaceous strata at Prairie Bluff, Alabama.

2. *P. australis*, (S. G. M.)

*Specific character.* Suborbicular, nearly equilateral, convex; beaks small, pointed, slightly prominent, central; inner margin crenulated.

Found with the preceding, from which it differs in being somewhat of a lenticular form; it is about the same size. It came too late to be figured.

3. I possess casts of another species from the marl of New Jersey.

## ARCA.

*A. rostellata*, (S. G. M.) Pl. iii, fig. 11.

*Specific character.* Elongated, narrow, ventricose; with numerous delicate costæ radiating from the beaks to the margin; the latter having a subcentral, gaping constriction.

Length, an inch and a quarter; breadth, five-eighths of an inch.

From Alabama.

## CUCULLÆA.

1. *C. vulgaris*, (S. G. M.) Pl. iii, fig. 8: and a cast, pl. xiii, fig. 5.

*Specific character.* Ventricose, ovato-triangular, flattened

before; beak prominent and incurved; shell thick, with numerous delicate, longitudinal striæ.

Length, one inch and three-fourths; breadth, one inch and a quarter.

Cordiform casts of this species are common throughout the arenaceous deposits; but I am indebted to my friend Dr. Wm. Riley for the perfect shell from which the annexed figure was drawn.

2. *C. antrosa*, (S. G. M.) Pl. xiii, fig. 6.

*Specific character.* An extremely ventricose cast, marked with numerous longitudinal striæ; beaks prominent and incurved.

Although I have only seen casts of this species, it is so characteristic of the ferruginous sand, that I have ventured to name and figure it.

#### NUCULA.

I have seen a few small casts in a ferruginous clay, from the vicinity of Bordentown, N. J.

#### TRIGONIA.

*T. thoracica*, (S. G. M.) Pl. xv, fig. 13.

*Specific character.* Obovate, with oblique very prominent ribs, about twelve in number.

Among a great number of casts of *Trigoniæ* from New Jersey and Alabama, I have but two with the shell remaining, one of which is seen on the annexed plate. Mr. Conrad obtained it at Prairie Bluff, Alabama.

This species is variable in outline, but is readily identified by its other characters.

## CARDIUM.

1. Casts of a smooth species are common in all the strata: they vary in size from half an inch to an inch in length.

2.? Larger, ventricose casts, strongly ribbed.

## CARDITA.

*C. decisa*, (S. G. M.) Pl. ix, fig. 3.

*Specific character.* Subtriangular, ventricose, longitudinally striated and transversely undulated; posterior end truncated; margin straight.

From the blue marl of St. Georges, Delaware.

I am not positive that this cast is from a *Cardita*; but it most resembles this genus, and is unlike any other marl fossil with which I am acquainted.

## CRASSATELLA.

*C. vadosa*, (S. G. M.) Pl. xiii, fig. 12.

*Specific character.* Ovato-triangular, slightly compressed; with about thirty distinct, concentric striæ.

Length, one inch and a quarter; breadth, one inch.

From the older cretaceous strata at Prairie Bluff, Alabama. Mr. T. A. Conrad. Casts of this genus are not uncommon in New Jersey. It is probable that the blackish ones so common in the neighborhood of Long Branch, belong to *Crassatella*. Mr. Vanuxem has spoken of them as *Mytili*, in which I followed him; but there can be no doubt of this being a mistake.

## VENILIA, (S. G. M.)

*Generic character.* An equivalve bivalve; hinge with three robust cardinal teeth in each valve, and an elongated, thick, lateral tooth on the posterior side, similar to that of *Unio*: anterior muscular impression profound.

*V. Conradi*, (S. G. M.) Pl. viii, fig. 1 and 2.

*Specific character.* Trigonal, ventricose, thick, concentrically sulcated; beaks long and incurved.

Diameter, one inch and a half.

This singular marine shell, so different from any of the hitherto known genera, was discovered at Arneytown, New Jersey, by my friend Mr. T. A. Conrad, in whose name I gladly introduce it to notice. He has since found it at Prairie Bluff, Alabama. It is possible that the *ASTARTE trigonalis*, of Sowerby, (Min. Conch. pl. ccccxliv,) may belong to this genus.

## CYTHEREA.

*C. excavata*, (S. G. M.) Pl. v, fig. 1.

*Specific character.* Suborbicular, compressed; posterior slope deeply excavated; posterior side with an obsolete fold; margin angular.

Diameter, about an inch and a half.

Found by Mr. T. A. Conrad, at Arneytown, New Jersey.

## LUTRARIA?

Casts are occasionally found seemingly belonging to this genus. One from the marl of Delaware strongly resem-

bles Sowerby's *SANGUINOLARIA undulata*, tab. cxlviii, fig. 2.

#### PHOLADOMYA.

*P. occidentalis*, (S. G. M.) Pl. viii, fig. 3.

*Specific character.* Oblong-ovate, anterior margin rounded, ventricose; posterior margin obtusely truncated, compressed; with twenty-five or thirty narrow, elevated, sub-tortuous costæ, having much broader, slightly concave, intervening spaces.

Length, three inches; breadth, about one-third less.

I have examined five imperfect specimens in the Academy, all of which differ in the number and relative position of the costæ. Mr. Featherstonhaugh possesses a perfect cast.

From the excavations of the Chesapeake and Delaware canal.

#### PHOLAS.

*P. cithara*, (S. G. M.) Pl. ix. fig. 10.

*Specific character.* Ovato-cuneate, ventricose, cancellated, with an oblique groove passing from beak to base.

Length, three-fourths of an inch.

Obtained from the blue marl of Monmouth county, N. Jersey, by Lieut. Mather, to whose kindness I am indebted for an opportunity of describing and figuring it.

#### TEREDO.

*T. tibialis*, (S. G. M.) Pl. ix, fig. 2.

In the former edition I referred this species to *T. an-*

*tenautæ*, Sowerby; but a few opportunities of examining casts of the contained bivalve, induce me to consider it a much more elongated, angular and compressed shell, than that represented in Mr. Sowerby's figure.

Of frequent occurrence in both divisions of the cretaceous group in New Jersey. In the calcareous strata its shelly tube is often replaced by crystallized carbonate of lime. In the friable marls it is mostly observed in casts in lignite: these remains are sometimes pyritous, and half an inch in diameter.

#### CLAVAGELLA, Deshayes.

*C. armata*, (S. G. M.) Pl. ix, fig. 11.

*Specific character.* Disk obtusely compressed, divided by an irregular fissure, and armed with four or five tubular spines; two or three other spines below the disk; bivalve concentrically furrowed or striated.

This first American species of a rare and curious genus, differs in several respects from the *C. coronata* of Deshayes, (Sowerby, pl. cccclxxx,) as in the number and arrangement of the spines &c. One valve is obviously attached to the shelly tube; but I cannot ascertain whether the spines in my specimen have been branched, as in the European species.

First found in the friable arenaceous marl near Arneytown, N. J., by Mr. T. A. Conrad; and more recently by the same gentleman at Prairie Bluff, Alabama.

## BRACHIOPODA.

## TEREBRATULA, Lam.

1. *T. Harlani*, (S. G. M.) Pl. iii, fig. 1; and pl. ix, fig. 8 and 9.

Amer. Journ. Science, vol. xviii, pl. iii, fig. 16; Journ. Acad. Nat. Sciences of Philad. vol. vi, pl. iii.

*Specific character.* Thick, elongated; upper valve convex, biphlicated at the margin; lower valve very convex, with a longitudinal ridge, and slight lateral depressions; beak incurved. Length, from one to three inches.

Abundant at Egypt and other places in New Jersey, in the arenaceous strata.

*Var. A.* Rectilateral. Pl. ix, fig. 9.

*Var. B.* Discoidal. Pl. ix, fig. 8.

Notwithstanding the difference between *var. B.* and the usual forms of *T. Harlani*, I am not willing to consider it a distinct species, inasmuch as it appears to pass by insensible degrees into the other varieties. It is figured in the Journ. Acad. Nat. Sciences, vol. vi, pl. iii, fig. 7 and 8, and there provisionally referred to *T. perovalis*, of Sowerby, from which it is altogether distinct. If it should not prove to be a variety of *T. Harlani*, I propose for it the name of *T. camella*.

2. *T. fragilis*, (S. G. M.) Pl. iii, fig. 2.

*Specific character.* Very thin, fragile; rectilateral, sides parallel; upper valve sub-convex, with two longitudinal ridges almost its whole length, forming a deep biphlication; inferior valve very convex, with a prominent central ridge and corresponding lateral depressions.

Length, about an inch and three fourths; breadth, three fourths of an inch.

Found in the lower friable strata at Egypt, New Jersey.

The general outline of this handsome species is similar to that of *T. Harlani*; from which, however, it is readily distinguished by its strongly marked ridges and sinuses, the remarkable flatness of its upper valve, and the extreme tenuity of its shell. It is more constant in its form than any other bivalve of this formation.

3. *T. Sayi*, (S. G. M.) Pl. iii, fig. 3 and 4.

*Syn.* *T. plicata*, Say. Amer. Journ. Science and Arts, vol. ii, p. 43.

*Specific character.* Suborbicular, with ten or twelve profound longitudinal plicæ in each valve, the two middle ones most conspicuous, crossed by three or four transverse striæ; upper valve subconvex, straight at the hinge margin; lower valve convex; beak triangular, not incurved; foramen small.

Length, three-fourths of an inch; breadth a little more.

The above description differs but little from that of Mr. Say, who adds that this shell bears considerable resemblance to the *T. crumena* of Sowerby, (Min. Conch. table lxxxiii, fig. 2 and 3.)

The name *plicata* having been first used by M. Lamarck for another species, was necessarily changed; I therefore take the opportunity to dedicate this beautiful fossil to my friend Mr. Thomas Say.

Occurs in the marl of Burlington county, New Jersey, more particularly at Woodward's Farm, near Walnford, from whence it was first brought by Mr. Samuel R. Wetherill.

4. *T. lachryma*, (S. G. M.) Pl. x, fig. 11, and pl. xvi, fig. 6.

*Specific character.* Ovato-triangular; beak elongated, foramen large; valves convex, marked by delicate longitudinal striæ.

Length, half an inch; breadth, one-fourth of an inch.

This beautiful species is abundant in the calcareous strata of South Carolina, whence I received it through Mr. Conrad. This gentleman has more recently obtained it from the same strata below Claiborne, Alabama.

5. *T. floridana*, (S. G. M.) Pl. xvi. fig. 7.

*Specific character.* Suborbicular, with a slight biplication, and obscure longitudinal striæ; beak produced, not incurved; foramen small; both valves nearly equally convex.

Diameter, about half an inch.

From the older cretaceous strata at Prairie Bluff, Alabama, whence I received it through Mr. Conrad.

#### CIRRHOPODA.

##### BALANUS.

1. *B. peregrinus*, (S. G. M.) Pl. x, fig. 5.

The valves of this species have distinct longitudinal striæ, crossed by obscure lines. The shell, in all the specimens I have seen, is of a reddish color, and remarkably perfect. It varies in diameter from half an inch to one inch and a half.

Found by Mr. Conrad in the calcareous strata of South Carolina.

## ANIMALIA ARTICULATA.

## ANNELIDES.

## SERPULA.

1. *S. barbata*, (S. G. M.) Pl. xv, fig. 12.

*Specific character.* With three or four distinct, longitudinal, tortuous, dentated lamellæ, projecting from the surface.

A very remarkable species from Alabama. Mr. T. A. Conrad.

2. Dr. M'Euen found another species, smooth and much smaller, near Deal, in New Jersey.

3. Mr. Say (Amer. Journ. Science, vol. ii,) mentions another species with sixteen equal costæ, from New Jersey. I have not seen it.

## HAMULUS, (S. G. M.)

*Generic character.* Tubular, regular, involuted; volutions distinct; aperture circular.

A genus allied to Dentalium and Serpula, but differing in its constant involuted form.

- H. onyx*, (S. G. M.) Pl. ii, fig. 8, and pl. xvi, fig. 5.

*Specific character.* With six elevated, angular, longitudinal ribs extending from base to apex.

Length, about an inch.

The imperfect specimen figured on plate ii, was obtained by Dr. Blanding at Lynch's creek, South Carolina, in the green sand, and on a former occasion was supposed to be a Dentalium. Pl. xvi, fig. 5, however, represents the perfect shell from the older cretaceous deposits at

Erie, Alabama. I have a small individual from New Jersey. It has never been found attached.

Dr. Goldfuss, in his *Petrefacten*, pl. lxx, fig. 13, gives a fossil which he calls *SERPULA sexsulcata*, from the Upper Palatinate. It is obviously congeneric with *Hamulus*.

#### CRUSTACEA.

##### ASTACUS, Lam.

A small species, with most of its parts entire, was obtained at the canal excavations in Delaware.

##### CANCER, Lin.

Dr. Van Rensselaer\* has described and figured four fragments, chiefly claws, from the vicinity of Sandy Hook. Similar remains of several distinct species are contained in the cabinet of the Academy, but mostly too imperfect to allow of a precise classification.

#### ANAMALIA RADIATA.

##### ECHINODERMATA.

##### ASTERIAS.

I have seen but a few obscure fragments of this genus, from the calcareous strata of South Carolina.

\* *Annals of the New York Lyceum*, vol. i, page 195 &c.

## ECHINUS, Lam.

*E. infulatus*, (S. G. M.) Pl. x, fig. 7.

*Specific character.* Having five pairs of tubercles running from the mouth to the apex; as they approach the latter converging and becoming smaller: intermediate between each pair of tubercles are four other rows, commencing at the mouth and terminating just above the margin.

Diameter, three-fourths of an inch.

Found by Mr. Conrad in the calcareous strata of South Carolina.

## CIDARITES, Lam., Goldf.

*C. diatretum*, (S. G. M.) Pl. x, fig. 10.

This beautiful species, of which I found in the limestone of Gloucester, New Jersey, a solitary specimen, is about three-fourths of an inch in diameter, and much compressed.

## NUCLEOLITES, Lam., Goldf.

*N. crucifer*, (S. G. M.) Pl. iii, fig. 15.

Amer. Journ. Science, vol. xviii, pl. iii, fig. 8.

*Specific character.* Ovoidal, compressed, with five ambulacra, each composed of two nearly parallel lines, and an insulated line between each pair of ambulacra; mouth sub-central; margin rounded.

Length, from half an inch to an inch.

Common in the calcareous strata of New Jersey.

In the former edition this fossil was placed under the genus *Ananchytes*.

## CASSIDULUS, Lam.

*C. æquoreus*, (S. G. M.) Pl. iii, fig. 14.

*Specific character.* Compressed, suboval, with five ambulacra, consisting of two pairs of dotted lines arranged elliptically; anus large, above the margin; base concave, delicately dotted or tuberculated; mouth nearly central, pentangular.

Long diameter, one inch.

From the Ferruginous sand of Prairie Bluff, Alabama.  
Mr. T. A. Conrad.

The differences between Nucleolites and Cassidulus are scarcely sufficient to warrant generic distinctions; but I place this fossil with the latter, in accordance with the views of Lamarck and others.

## CLYPEASTER, Lam.

1. *C. florealis*, (S. G. M.) Pl. iii, fig. 12, and pl. x, fig. 12.

*Specific character.* Very convex or subconical; each of the five ambulacra composed of two pairs of finely dotted lines; base suboval, concave; margin abrupt.

The specimen figured is a finely preserved cast, from the Ferruginous sand of the Delaware and Chesapeake canal.

2. *C. geometricus*, (S. G. M.) Pl. x, fig. 9.

*Specific character.* Hemispherical; ambulacra elevated, formed of two pairs of lines connected by transverse striæ; mouth stelliform, with five radiating ridges that pass the margin, and become continuous with the ambulacra.

Occurs in the canal excavations of Delaware.

## SCUTELLA, Lam.

1. *crustuloides*, (S. G. M.) Pl. xv, fig. 10.

*Specific character.* Orbicular, centre elevated, margin thick; five short, sub-elliptical ambulacra.

Diameter, from a fourth of an inch to near an inch.

This species is very distinct from any I have met with, recent or fossil. It is found in considerable numbers in the calcareous strata of South Carolina.

2. *S. Lyelli*, (Conrad.) Pl. x, fig. 8.3. *S. Rogersi*, (S. G. M.) Pl. xiii, fig. 3.

*Specific character.* Subovate or suboval, slightly convex; posterior margin truncated; ambulacra slightly prominent, open at the marginal extremities; apex central; beneath slightly concave, with five simple, compressed lines, corresponding to the ambulacra; anus near the posterior end, one-sixth of the distance from the posterior margin to the mouth.

Common in the newer cretaceous strata of Monroe county, Alabama. T. A. Conrad.

I have much pleasure in naming this beautiful species after my kind friend Henry D. Rogers, Esq.

## SPATANGUS, Lam.

1. *S. parastatus*, (S. G. M.) Pl. iii, fig. 21.

Amer. Journ. Science, vol. xiii, pl. iii, fig. 10 and 11.

*Specific character.* Five excavated ambulacra, the posterior one extending to the base, the other four to the margin; posterior end remarkably elevated.

Length, one inch.

I formerly referred this species to *S. cor marinum*, from which it is distinct.

The *S. stella* of the former edition of this synopsis, figured in plate iii, fig. 18, and in American Journal of Science, vol. xviii, pl. iii, fig. 11, is the young of this species, which is now found to be abundant in the arenaceous strata of Alabama, especially at Prairie Bluff. I first found it in the calcareous beds on Timber creek, New Jersey.

2. *S. ungula*, (S. G. M.) Pl. x, fig. 6.

*Specific character.* Very compressed, with five excavated ambulacra; apex central.

From the arenaceous strata of the Chesapeake and Delaware canal. The very elevated posterior end of the former species is a striking and constant difference between it and the *S. ungula*.

ANANCHYTES, Lam., Park.

1. *A. cinctus*, (S. G. M.) Pl. iii, fig. 19.

Amer. Journ. Science, vol. xviii, pl. iii, fig. 7.

*Specific character.* Cordiform, with five pairs of dotted ambulacra, the posterior pair being in a deep sulcus extending to the base.

Common in the calcareous strata of New Jersey.

2. *A. fimbriatus*, (S. G. M.) Pl. iii, fig. 20.

Amer. Journ. Science, vol. xviii, pl. iii, fig. 9.

*Specific character.* Cordiform, with five pairs of dotted ambulacra, the posterior pair being in a sulcus extending to the

base, and having, in addition, from sixteen to twenty lines running from the apex to the base.

Found with the preceding species.

The ambulacra of these two fossils extend to the mouth, or they would have belonged to the genus *Spatangus*, with which I think they should be associated, notwithstanding.

### POLYPI.

#### FLUSTRA, Lam.

*F. sagena*, (S. G. M.) Pl. xiii, fig. 7.

Compare with Ellis, Nat. Hist. Cor. pl. xxix, fig. *a*.

Abundant in the calcareous strata of New Jersey, where it occurs in thin expanded laminæ, an inch or two inches in diameter. Perhaps this is an *Eschara*.

#### ESCHARA, Lam.

*E. digitata*, (S. G. M.) Pl. xiii, fig. 8.

*Specific character.* . . . . .

Strongly resembles *E. dichotoma*, Goldf., from Maestricht, (Petrifacten, tab. viii, fig. 15.)

Common in the calcareous strata.

### RETEPORA.

Found with the preceding genera, but is rare. It is well represented by a species from Maestricht, delineated by Faujas (Hist. Nat. pl. xxxix, fig. 2,) who calls it a *Gorgonia*. Dr. Goldfuss figures a specimen also from

Maestricht, to which he gives the name of *Retepora clathrata*, (Petrif. tab. ix, fig. 12.)

### ANTHOPHYLLUM, Schweigg.

*A. atlanticum*, (S. G. M.) Pl. i, fig. 9, 10.

Journ. Acad. Nat. Science, vol. vi, pl. viii, fig. 9, 10.

*Specific character.* Conical, or subcylindrical, composed of longitudinal septæ or plates diverging uniformly from a central axis.

Seldom more than inch in length, and one third less in breadth. Each individual is attached by its base, and surrounded on its remaining sides by a cavity, which mostly terminates in a pointed cone.

Common in the limestone of Gloucester county, New Jersey.

Faujas, in his history of the mountain of St. Pierre, pl. xxxvii, fig. 3, and pl. xxxviii, fig. 1 and 5, gives drawings of some fossils which appear to be generically the same with those from New Jersey. But I derive the characters of the genus *Anthophyllum* from the splendid work of Dr. Goldfuss, tab. xiii, fig. 11. The specimen delineated by that naturalist is stated to be from secondary limestone near the Falls of Niagara.

### ALVEOLITES.

*A. cepularis*, (S. G. M.)

*Specific character.* . . . . .

This zoophyte is occasionally found in the calcareous strata of New Jersey, and bears considerable resemblance to the recent species, *A. glomeratus* of Say.

## TURBINOLIA, Lam.

*T. inauris*, (S. G. M.) Pl. xv, fig. 11.

*Specific character.* . . . . .

Common in the arenaceous strata of Alabama, and occasionally met with in New Jersey.

## ALCYONIUM.

The stems of this zoophyte are not unfrequently found in both strata. I have but twice seen the cup-shaped extremity. Mr. H. D. Rogers found, in the calcareous beds of New Jersey, a perfect mould, including the base, and measuring nearly ten inches in length. I have fragments from Alabama.

Mr. Conrad has sent me from the calcareous strata of the southern states, some singular and beautiful species of Zoophytes, but my knowledge of the subject is too imperfect to enable me to classify them.

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ADDENDA ET CORRIGENDA.

The following fossils were accidentally omitted from their proper places in the preceding synopsis :

## VERMETUS, Sowerby.

*V. rotula*, (S. G. M.) Pl. i, fig. 14.

*Specific character.* Orbicular, volutions four or five in number, flattened, in contact throughout; aperture quadrangular, which form is preserved in all the whorls.

Diameter of the largest specimens, three-eighths of an inch.

From the calcareous strata of New Jersey, where it is of frequent occurrence.

This shell has a strong resemblance to *Planorbis*; and Mr. Sowerby mentions that he found shells of a similar character in the English Green sand, (Min. Coch. p. 89, 92.) The American shell appears to belong to the genus *Vermetus* as revised by Mr. Sowerby.

#### TELLINA.

Finely preserved casts of a delicate Tellina, upwards of an inch in length, occur in the arenaceous beds of New Jersey.

#### LUNULITES.

Casts of a Lunulite, about a fourth of an inch in diameter, have been observed with the preceding fossil.

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It will be observed that I have used the genus *Ammonites* in its unrestricted acceptation: the *A. Delawarenensis* and *A. vespertinus* are true Ammonites, while all the other species of this synopsis might be associated with the genus *Orbitulites* of Lamarck.

## CONCLUSION.

IT is well known that there is at present a remarkable generic accordance, between the testaceous mollusca of the eastern and western shores of the Atlantic ocean ; and by a reference to No. 2 of the Appendix, it will be seen that at least twenty-four *species* of shells have already been identified as common to both. Is it not probable that this accordance was formerly as great as at present? It will be hereafter seen that I have also traced some identities in the tertiary deposits of Europe and America ; and when we arrive at the Cretaceous group, the highest of the secondary series, we find the *PECTEN quinquecostatus*, (which has been aptly called the “finger post” of the chalk formation,) as frequent as it is unequivocal, on both sides of the Atlantic. Although I have been unable to satisfy myself of any other *identities* in the widely separated portions of this series, yet the *analogues* are surprisingly obvious, and may be judged of by a mere glance at the accompanying plates.

Again, the analogy is not confined to the Testacea, but is observed in the great family of the Saurian reptiles ; for there is no perceptible difference between the teeth of the *Mosasaurus* of Europe and that of New Jersey. From these and other data scattered through this work, I arrive at the conclusion, that when the chalk fossils were living inhabitants of the seas of Europe, the organic relics of this synopsis were alive in the ocean of America ; in

other words, that they were contemporaneous beings. Whatever cause laid bare the eastern portion of the series, appears to have acted simultaneously on the western mass: not a rush of currents, but either a subsidence of the sea, or elevation of the land, which has left the fossils in their original beds unbroken, and, as to their external form, unaltered.

In conclusion, I beg leave to state, that this work has been written during the constant interruptions of a professional life; and I cast it as a grain of sand on the mountain of geological knowledge, which has been heaped up by the genius and industry of the naturalists of both hemispheres.

## APPENDIX.

## No. I.

It remains to offer a few remarks on an interesting feature of our marls; I allude to the abundance of *Lignite* and *Amber*, (Succinite,) contained in some of them, especially in the lower mass of strata traversed by the Chesapeake and Delaware canal.

Lignite was at one period considered to be indicative of Tertiary formations, but it is now frequently recognized in the green sand of Europe: and as analogies in geological arrangement in remote parts of the world, are both interesting and instructive, a few instances may be adduced to illustrate the point in question. M. Boüe informs us that the marls which alternate with the ferruginous and green sandstones, (grès ferrugineux et vert,) below the chalk in the south west of France, contain beds of Lignite.\* M. Boüe further remarks that Lignite and retinasphalt characterize the green sand formation (craie chloritée) at Obora, in Moravia. In allusion to these Lignites he says:—"Ces bois montrent qu'ils ont été longtemps sur la rivage de la mer, puis qu'ils sont couverts d'huîtres et de ser-pules, et qu'ils sont percés de trous de Tarets (Teredo) qu'ont remplis postérieurement par de la pyrite." The last two circumstances are common to our own Lignites.

Humboldt, in his "Tableau des Formations Geologiques," gives as a synonym of the Ferruginous sand series, *gres secondaire a lignites*, in contradistinction to his *gres tertiaire a lignite*, or Plastic clay formation.

Cuvier† describes the green sand of France as containing both Lignite and Amber, the former being abundant in the strata between Dives and Fecamp. Another remarkable instance occurs in the green sand of the Isle d'Aix, near La Rochelle. At this place is a submarine forest of dicotyledonous trees, sometimes bituminous and brittle, and again having the texture of jet. These Lignites are perforated by the Teredo, and accompanied by Amber.‡

The lower divisions of the Green sand of England contain considerable quantities of fossil wood, and even regular beds of wood coal.§

\* Ann. des Sciences Nat. tom. iii. p. 309.

† Discours sur les Révolutions &c. p. 294.

‡ Humboldt, Gisement des Roches, p. 294 and 297.

§ Conyb. and Phil. Geol. p. 137.

## No. II.

The following list of recent shells common to the European and American coasts of the Atlantic, has been arranged with much care by Mr. Conrad and myself, and is introduced here because it may subserve the interests of Geology :

1. *Purpura lapillus*.
2. *Buccinum undatum*.
3. *Natica canrena*.
4. *Fusus islandicus*.
5. *Cyprina islandica*.
6. *Saxicava rugosa*.
7. \* *Lucina divaricata*.
8. *Pholas crispata*.
9. ——— *costata*.
10. *Solen ensis*.
11. *Mya arenaria*.
12. *Mytilus edulis*.
13. *Modiola papuana*.
14. *Macra deaurata*.
15. *Spirorbis nautiloides*.
16. *Thracia convexa*.
17. *Solecurtus fragilis*.
18. *Glycimeris siliqua*.
19. *Cardium groenlandicum*.
20. ——— *islandicum*.
21. *Strigilla carnaria*.
22. *Tellina punicea*.
23. *Pecten islandicus*.
24. *Balanus ovularis*.

## No. III.

List of fossil shells common to the strata of Europe and America :

## UPPER MARINE, OR OLDER PLIOCENE.

*Lucina divaricata*, Lam.

† *Cerithium melanoides*, Sow.

\* This shell is still an inhabitant of the United States, of Europe and of the West Indies : it is also found fossil in England, France and the United States ; and I have also seen it in the coralline limestone of the island of Barbadoes. " These facts," observes Mr. Conrad, " show how extensive may be the distribution, and how long the duration of a single species."

† In England this fossil is found in the London clay.

- Ostrea Virginiana*, Gmel.  
*Bulla acuminata*, Sow.  
 \* *Venus rustica* ? Sow.  
 † *Pectunculus subovatus*, Say.  
 ‡ *Panopæa Faujasii*.

## EOCENE, OR LONDON CLAY.

- Corbis lamellosa*, Lam.  
*Cardita planicosta*, Blain.  
*Bulimus terebellatus*, Lam.  
 § *Solarium patulum*, Lam.  
 || *Solarium canaliculatum*, Lam.  
*Fistulana elongata*, Desh.

## CRETACEOUS GROUP.

*Pecten quinquecostatus*.

Although the preceding list embraces all that can at present be positively identified as common to the strata of Europe and America, there can be no question that further observation will detect many others, not only in the tertiary beds, but also in the cretaceous series.¶

## No. IV.

Table, shewing the Organic Remains common to the older and newer Cretaceous strata, and to the latter and the Eocene, (London clay,) in the United States:

Formations.	Range of Species.
Eocene, or London clay.	{ <i>Plagiostoma dumosum</i> , <i>Ostrea sellæformis</i> , <i>Pecten calvatus</i> , <i>Scutella Lyelli</i> .
Newer cretaceous strata.	{ <i>Plagiostoma dumosum</i> , <i>Ostrea sellæformis</i> , <i>Pecten calvatus</i> , <i>Gryphæa vomer</i> , <i>Ostrea cretacea</i> , <i>Ostrea panda</i> , <i>Scutella Lyelli</i> .
Older Cretaceous strata or Ferruginous sand.	{ <i>Gryphæa vomer</i> , <i>Ostrea cretacea</i> , <i>Ostrea panda</i> .

- \* *Isocardia fraterna*, Say.      † *P. variabilis*, Sowerby.      ‡ *P. reflexa*, Say.  
 § *S. serobiculatum*, Conrad.      || *S. ornatum*, Lea.

¶ The geological analogies between America and Europe are conspicuous in all the formations. Vide Prof. Buckland's note in the American Journal of Science, vol. iv, p. 186. See also the very interesting observations contained in chap. I. of Mr. Maclure's Geology of the United States.

## No. V.

In appending a catalogue of Tertiary shells, it has been thought best to employ the following nomenclature of the strata to which they belong :

Upper Tertiary, Newer Pliocene, or Quaternary,

Middle Tertiary, or Upper Marine,\*

Lower Tertiary, or Eocene.

Mr. Conrad found the following shells in the Newer Pliocene on the Potomac, about three miles from its mouth :

## UNIVALVES.

*Acteon melanoides*, Conrad ; *Crepidula convexa*, Say ; *C. glauca*, Say ; *Fusus cinereus*, Say ; *Nassa obsoleta*, Say ; *N. trivittata*, Say ; *Natica duplicata*, Say ; *N. interna*, Say ; *Ranella caudata*, Say ; *Scalaria*.

## BIVALVES.

*Arca transversa*, Say ; *A. ponderosa*, Say ; *Corbula contracta*, Say ; *Rangia cyrenoides* ; *Cytherea Sayana*, Conrad ; *Mactra lateralis*, Say ; *Mya arenaria* ; *Mytilus hamatus*, Say ; *Nucula lævis*, Say ; *N. acuta*, Con. ; *Pandora trilineata*, Say ; *Petricola pholadiformis*, Lam. ; *Pholas costata*, Lam. ; *Sanguinolaria fusca*, Con. ; *S. lusoria*, Con. ; *Solecurtus caribæus* ; *S. ensis*, Lin. ; *Venus mercenaria*, Lam. ; *Venus*.

In the preceding list, but three species occur which have not been satisfactorily identified with existing shells of the middle and southern coasts.

In addition to these, the *Colombella avara* of Say and some other species were found in digging a well in the city of Charleston. They are in Professor Ravenel's collection, and are as brilliant in their colors and polish as living shells. No extinct species was found among them.

\* See note at the end of the following catalogue.

# CATALOGUE

OF THE

## FOSSIL SHELLS

### Of the Tertiary Formations of the United States,

EMBRACING ALL THE SPECIES HITHERTO PUBLISHED.

Mr. CONRAD having visited many localities of Tertiary fossils on this side of the Mississippi, has been able to add far more than any one else to our knowledge of this series of formations. He has from time to time published the results of his discoveries, in his work on the "Fossil Shells of the Tertiary Formations of North America," in the American Journal of Science, Vol. XXIII. and in the "Journal of the Academy of Natural Sciences of Philadelphia." From these sources, from Mr. Say's papers, and from Mr. Lea's "Contributions," the following catalogue has been compiled; and for that portion of it which relates to the Eocene of Alabama, I am wholly indebted to Mr. Conrad, who politely furnished it at my request.

The names of those species which are both recent and fossil are printed in *italics*.

#### FOSSIL SHELLS OF THE MIDDLE TERTIARY FORMATION.

Trochus humilis,	Conrad.	Scalaria clathrus,	Lam.
reclusus,	"	Actæon novellus,	Conrad.
Mitchelli,	"	melanoides,	"
philanthropus,	"	ovoides,	"
lapidosus,	"	Pyramidella arenosa,	"
bellus,	"	Natica interna,	Say.
Solarium nuperum,	"	heros,	"
Delphinula lyra,	"	duplicata,	"
Pleurotoma biscatenaria,	"	Capulus lugubris,	Conrad.
tricateneria,	"	Crepidula costata,	Morton.
incilifera,	"	fornicata,	Lam.
rotifera,	"	aculeata?	"
communis,	"	convexa,	Say.
parva,	"	glauca,	"
dissimilis,	"	plana,	"
limatula,	"	Dispotæa costata,	"
Virginiana,	"	grandis,	"
pyrenoides,	"	Sigaretus fragilis,	Conrad.
Turritella variabilis,	"	Syn. Natica fragilis,	"
octonarius,	"	Conus diluvianus,	Green.
alticostata,	"	Marylandicus,	"
laqueata,	"	Cypræa annulus,	Lam.
æquistriata,	"	Voluta solitaria,	Conrad.
plebeia,	Say.	Oliva litterata,	Lam.

<i>Oliva zonalis</i> ,	<i>Lam.</i>	<i>Arca arata</i> ,	<i>Say.</i>
<i>Marginella limatula</i> ,	<i>Conrad.</i>	<i>ponderosa</i> ,	"
<i>eburneola</i> ,	"	<i>transversa</i> ,	"
<i>denticulata</i> ,	"	<i>incile</i> ,	"
<i>nana</i> ,	"	<i>centenaria</i> ,	"
<i>Cancellaria perspectiva</i> ,	"	<i>stillicidium</i> ,	<i>Conrad.</i>
<i>lunata</i> ,	"	<i>idoneus</i> ,	"
<i>alternata</i> ,	"	<i>limulus</i> ,	"
	"	<i>maxillata</i> ,	"
<i>Buccinum porcinum</i> ,	<i>Say.</i>	<i>granulifera</i> ,	"
<i>laqueatum</i> ,	<i>Conrad.</i>	<i>Pectunculus subovatus</i> ,	<i>Say.</i>
<i>altile</i>	"	<i>pulvinatus</i> ,	<i>Lam.</i>
<i>Nassa trivittata</i> ,	<i>Say.</i>	<i>Nucula laevis</i> ,	<i>Say.</i>
<i>lunata</i> ,	"	<i>Syn. N. limatula?</i>	"
<i>quadrata</i> ,	<i>Conrad.</i>		
<i>impressa</i> ,	"	<i>proxima</i> ,	"
<i>Cassis caelata</i> ,	"	<i>acuta</i> ,	<i>Conrad.</i>
<i>Terebra simplex</i> ,	"	<i>Modiola tulipa?</i>	<i>Lam.</i>
<i>Cerithium dislocatum</i> ,	<i>Say.</i>	<i>Cardita granulata</i> ,	
<i>Murex umbrifer</i> ,	<i>Conrad.</i>	<i>Syn. Ven. granulata</i> ,	<i>Say.</i>
<i>Typhis acuticosta</i> ,	"	<i>Cypricardia arata</i> ,	<i>Conrad.</i>
<i>Fusus cinereus</i> ,	<i>Say.</i>	<i>Crassatella undulata</i> ,	<i>Say.</i>
<i>quadriricostatus</i> ,	"	<i>Marylandica</i> ,	<i>Conrad.</i>
<i>trossulus</i> ,	<i>Conrad.</i>	<i>melina</i> ,	"
<i>tetricus</i> ,	"	<i>Chama corticosa</i> ,	"
<i>parilis</i> ,	"	<i>congregata</i> ,	"
<i>rusticus</i> ,	"	<i>Isocardia fraterna</i> ,	<i>Say.</i>
<i>Fulgur carica</i> ,	<i>Say.</i>	<i>Cardium laqueatum</i>	<i>Conrad.</i>
<i>canaliculatus</i> ,	"	<i>Donax fossor</i> ,	<i>Say.</i>
<i>incilis</i> ,	<i>Conrad.</i>	<i>Tellina æquistriata</i> ,	<i>Conrad.</i>
<i>Fissurella alticosta</i> ,	"	<i>egena</i> ,	"
<i>Griscomi</i> ,	"	<i>biplicata</i> ,	"
<i>Ostrea Virginiana</i> ,	<i>Gmel.</i>	<i>Strigilla carnaria</i> ,	<i>Turton.</i>
<i>Syn. O. Virginica</i> ,	<i>Lam.</i>	<i>Lucina anodonta</i> ,	<i>Say.</i>
<i>solea</i> ,	<i>Conrad.</i>	<i>contracta</i> ,	"
<i>compressirostra</i> ,	<i>Say.</i>	<i>subobliqua</i> ,	"
<i>Pecten Jeffersonius</i> ,	"	<i>cribraria</i> ,	"
<i>Madisonius</i> ,	"	<i>trisulcata</i> ,	<i>Conrad.</i>
<i>septenarius</i> ,	"	<i>crenulata</i> ,	"
<i>Clintonius</i> ,	"	<i>edentula?</i>	<i>Lam.</i>
<i>Magellanicus</i> ,	<i>Lam.</i>	<i>divaricata</i> ,	"
<i>Rogersii</i> ,	<i>Conrad.</i>	<i>Mysia Americana</i> ,	<i>Conrad.</i>
<i>decemnarius</i> ,	"	<i>Syn. Lucina Americana</i> ,	<i>Def.</i>
<i>eboreus</i> ,	"	<i>acclinis</i> ,	<i>Conrad.</i>
<i>Anomia ephippium</i> ,	<i>Lam.</i>	<i>Venus mercenaria</i> ,	<i>Lam.</i>
<i>Plicatula marginata</i> ,	<i>Say.</i>	<i>deformis</i> ,	<i>Say.</i>
<i>Perna maxillata</i> ,	<i>Lam.</i>	<i>alveata</i> ,	<i>Conrad.</i>
<i>Syn. P. torta</i> ,	<i>Say.</i>	<i>Cytherea gigantea</i> ,	<i>Lam.</i>

<i>Cytherea Marylandica</i> ,	<i>Conrad.</i>	<i>Mactra congesta</i> ,	<i>Conrad.</i>
reposta,	"	delumbis,	"
pandata,	"	confraga,	"
<i>Sayana</i> ,	"	modicella,	"
<i>Syn. C. convexa</i> ,	<i>Say.</i>	<i>Syn. M. clathrodon</i> ,	<i>Lea.</i>
albaria,	"	<i>lateralis</i> ,	<i>Say.</i>
<i>Artemis concentrica</i> ,		<i>Amphidesma carinata</i> ,	<i>Conrad.</i>
acetabulum,	<i>Conrad.</i>	nuculoides,	"
<i>Astarte undulata</i> ,	<i>Say.</i>	lamellosa,	"
vicina,	"	constricta,	"
symmetrica,	<i>Conrad.</i>	subovata,	<i>Say.</i>
lunulata,	"	æquale,	"
concentrica,	"	<i>Lutraria canaliculata</i> ,	"
obruta,	"	<i>Anatina antiqua</i> ,	<i>Conrad.</i>
<i>Pecticola centenaria</i> ,	"	<i>Panopea Faujasii</i> ,	<i>Men.</i>
<i>Venerupis subvexa</i> ,	"	<i>Syn. P. reflexa</i> ,	<i>Say.</i>
<i>Saxicava pectorosa</i> ,	"	<i>Pandora trilineata</i> ,	"
rugosa,	<i>Lam.</i>	arenosa,	<i>Conrad.</i>
<i>Syn. S. distorta</i> ,	<i>Say.</i>	<i>Solen ensis</i> ,	<i>Lin.</i>
<i>Lepton mactroides</i> ,	<i>Conrad.</i>	<i>Sanguinolaria lusoria</i> ,	<i>Conrad.</i>
<i>Corbula cuneata</i> ,	<i>Say.</i>	<i>Pholas costata</i> ,	<i>Lam.</i>
inæquale,	"	<i>Teredo</i> ———	
contrata,	"	<i>Pholadomya abrupta</i> ,	<i>Conrad.</i>
idonea,	<i>Conrad.</i>	<i>Serpula granifera</i> ,	<i>Say.</i>
elevata,	"	<i>Dentalium attenuatum</i> ,	"
<i>Mactra ponderosa</i> ,	"	thallus,	<i>Conrad.</i>
clathradonta,	"		

## FOSSIL SHELLS OF THE LOWER TERTIARY OR EOCENE PERIOD.

NAMES.		SYNONYMES.	
<i>Bulla galba</i> ,	<i>Conrad.</i>	<i>B. St. Hillairii</i> ,	<i>Lea.</i>
<i>Solarium elaboratum</i> ,	"		
alveatum,	"	<i>S. bilineatum</i> ,	"
funginum,	"	<i>S. Henrici</i> ,	"
exacuum,	"	<i>Delphinula plana</i> ,	"
canaliculatum,	<i>Lam.</i>	<i>S. ornatum</i> ,	"
antrosom,	<i>Conrad.</i>		
patulum,	<i>Lam.</i>	<i>S. scrobiculatum</i> ,	<i>Conrad.</i>
stalagmium	<i>Conrad.</i>	<i>S. elegans</i> ,	<i>Lea.</i>
amœnum,	"		
granulatum,	<i>Lea.</i>		
cancellatum,	<i>Conrad.</i>	<i>S. cancellatum</i> ,	<i>Lea.</i>
syrtalis,	"		
<i>Monoceros armigera</i> ,	"	{ <i>Melongena armigera</i> ,	<i>Conrad.</i>
		{ <i>Fusus Taitii</i> ,	<i>Lea.</i>

NAMES.	SYNONYMES.
Monoceros *vetusta, Conrad.	$\left\{ \begin{array}{l} M. pyruloides, \\ M. fusiformis, \end{array} \right.$ Lea.
Pleurotoma elaborata, "	"
tabulata, "	P. cœlata,
alternata, "	P. Lesuerii, "
Beumontii, Lea.	"
depygis, Conrad.	P. Londalii, "
nupera, "	$\left\{ \begin{array}{l} P. Desnoyersii, \\ P. Hæninghausii, \\ P. rugosa, \end{array} \right.$ "
parviuscula, "	"
proruta, "	$\left\{ \begin{array}{l} Fusus prorutus, \\ parvus, \end{array} \right.$ Conrad.
biseriata, "	Lea.
acutirostra, "	"
torticosta, "	"
Turritella Mortoni, "	T. carinata, "
obruta, "	T. lineata, "
Proto vetusta, "	Cerithium striatum, "
Scalaria nassula, "	S. planulata "
sessilis, "	S. carinata, "
Meleagris antiquatus, "	$\left\{ \begin{array}{l} Littorina antiquata, \\ Tuba striata, \\ alternata, \end{array} \right.$ Lea.
Pyramis striatus, "	$\left\{ \begin{array}{l} Pasithea striata, \\ sulcata, \end{array} \right.$ "
notata, "	notata, "
Actæon pomilius, "	$\left\{ \begin{array}{l} A. punctatus, \\ Monoptygma elegans, \end{array} \right.$ "
idoneus, "	A. lineatus, "
latus, "	"
costellatus, "	"
melanellus, Lea.	A. pygmæus, "
Pyramidella larvata, Conrad.	Actæon elevatus, "
*terebellata, Sowerby.	$\left\{ \begin{array}{l} Bulimus terebellatus, \\ Pasithea umbilicata, \end{array} \right.$ Lam.
Natica ætites, Conrad.	$\left\{ \begin{array}{l} N. gibbosa, \\ N. semilunata, \end{array} \right.$ Lea.
eminula, "	N. parva, "
limula, "	N. mamma, "
eborea, "	Turbo naticoides, "
Hipponix pigmæa, Lea.	"
Crepidula lirata, Conrad.	C. cornu-arietes, Lea.
dumosa, "	"

\* Mr. Lea divides this species because one of his specimens is umbilicated, the other not. I possess every variety between the two extremes from those with a simple indentation, to others profoundly umbilicated.

\* Deshayes, in his Tertiary tables, announces a new genus for this shell, but gives it no name. It may perhaps be properly referred to *Pyramis*, Brown. The specific name *terebellata* is preoccupied in the genus *Pyramidella*.

NAMES.		SYNONYMES.	
Infundibulum trochiformis,		I. trochiformis,	Lea.
Sigaretus bilix,	Conrad.	Natica striata,	"
arctatus,	"		
declivis,	"		
Conus sauridens,	Conrad.		
Voluta Sayana,	"	{ V. Defrancii,	"
		{ V. gracilis,	"
		{ V. parva,	"
petrosa,	"	V. Vanuxemi,	"
Oliva Alabamensis,	"	{ O. Greenoughii,	"
		{ O. dubia,	"
Phillipsii,	Lea.		
bombylis,	Conrad.	{ O. constricta,	"
		{ O. gracilis,	"
Marginella larvata,	"	M. ovata,	"
crassilabra,	"	M. anatina,	"
constricta,	"		
humerosa,	"	M. crassilabra,	"
Columba,	Lea.		
Mitra pactilis,	Conrad.		
perexilis,	"		
fusoides,	Lea.		
Cancellaria gemmata,	Conrad.	C. Babylonica,	"
		{ C. sculptura,	"
alveata,	"	{ C. tessellata,	"
		{ C. elevata,	"
		{ C. costata,	"
Nassa sarena,	"	{ Buccinum sargenum,	"
		{ Nassa cancellata,	"
Buccinum prorsum,	"		
amœnum,	"	Terebra gracilis,	"
Terebra perlata,	"	T. venusta,	"
costata,	Lea.		
Ancillaria scamba,	Conrad.		
atilis,	"	Anolax gigantea,	"
subglobosa,	"		
lymneoides,	"	Monoptygma Alabamiensis,	"
staminea,	"		
prætenuis,	"		
Cassis Taitii,	"		
nuperus,	"	Buccinum Sowerbii,	"
brevicostatus,	"		
Cerithium solitarium,	"		
decisum,	"	Fusus decisus,	Conrad.
sagenula,	"		
Murex engonatus,	"	Fusus sexangulus,	"
Mantelli,	"		
Vanuxemi,	"		

NAMES.		SYNONYMES.	
<i>Typhis gracilis</i> ,	"	<i>Murex alternata</i> ,	<i>Lea.</i>
<i>Fusus trabeatus</i> ,	"	<i>F. bicarinatus</i> ,	"
<i>papillatus</i> ,	"		
<i>inauratus</i> ,	"	<i>F. Fittonii</i> ,	"
<i>thoracicus</i> ,	"	<i>F. decussatus</i> ,	"
<i>irrasus</i> ,	"		
<i>protextus</i> ,	"		
<i>ranelloides</i> ,	"		
<i>thalloides</i> ,	"	<i>F. pulcher</i> ,	"
<i>altilis</i> ,	"		
<i>stamineus</i> ,	"		
<i>bellus</i> ,	"	<i>F. crebissimus</i> ,	"
<i>limulus</i> ,	"		
<i>Cooperii</i> ,	"		
<i>raphanoides</i> ,	"		
<i>ornatus</i> ,	<i>Lea.</i>	<i>F. acutus</i> ,	"
<i>salebrosus</i> ,	<i>Conrad.</i>		
<i>symmetricus</i> ,	"		
<i>Rostellaria velata</i> ,	"	<i>R. Lamarckii</i> ,	"
<i>laqueata</i> ,	"	<i>R. Cuvieri</i> ,	"
<i>Pyrula penita</i> ,	"	{ <i>P. cancellata</i> ,	"
		<i>P. elegantissima</i> ,	"
<i>Melongena alveata</i> ,	"	<i>Pyrula Smithii</i> ,	"
<i>Turbinella pyruloides</i> ,	"		
<i>prætenuis</i> ,	"		
<i>prisca</i> ,	"	<i>Voluta Cooperii</i> ,	"
<i>bolaris</i> ,	"	{ <i>Mitra bolaris</i> ,	<i>Conrad.</i>
		<i>Humboldtii</i> ,	<i>Lea.</i>
<i>Siliquaria vitis</i> ,	"	<i>S. Claibornensis</i> ,	<i>Lea.</i>
<i>Fissurella tenebrosa</i> ,	"	<i>F. Claibornensis</i> ,	"
<i>Emarginula arata</i> ,	"		
<i>Chiton antiquus</i> ,	"		
<i>Ostrea sellæformis</i> ,	"	{ <i>O. radians</i> ,	<i>Conrad.</i>
		<i>O. semilunata</i> ,	<i>Lea.</i>
		<i>O. divaricata</i> ,	"
<i>Carolinensis</i> ,	"		
<i>Alabamiensis</i> ,	<i>Lea.</i>	<i>O. lingua-canis</i> ,	"
<i>Pecten Deshayesii</i> ,	"	<i>P. Lyelli</i> ,	"
<i>Plagiostoma dumosum</i> ,	<i>Morton.</i>		
<i>Plicatula filamentosa</i> ,	<i>Conrad.</i>	<i>P. Mantelli</i> ,	"
<i>Avicula limula</i> ,	"	<i>A. Claibornensis</i> ,	"
<i>Arca cuculloidis</i> ,	"		
<i>rhomboidella</i>	<i>Lea.</i>		
<i>Pectunculus idoneus</i> ,	<i>Conrad.</i>		
<i>stamineus</i>	"	<i>P. Broderipii</i> ,	"
<i>trigonellus</i> ,	"	<i>P. deltoidea</i> ,	"
<i>cuneus</i> ,	"		

## APPENDIX.

7

NAMES.		SYNONYMES.	
Pectunculus aviculoides,	Conrad.	P. obliqua,	Lea.
declivis,	"	P. minor,	"
decisus,	"		
corbuloides,	"		
perplanus,	"		
circulus,	"		
Nucula magnifica,	"	N. Sedgewickii,	"
cæolata,	"	N. Brongniartii,	"
bella,	"	N. plicata,	"
opulenta,	"		
æqualis,	"	N. media,	"
pulcherrima,	Lea.		
ovula,	"		
Cardita alticostata,	Conrad.	{ Venericardia transversa,	"
rotunda,	"	V. Sillimani,	"
parva,	"	V. rotunda,	"
planicosta,	Blain.	V. parva,	"
Crassatella alta,	Conrad.	V. planicosta,	Lam.
protecta,	"		
alæformis,	"		
Donax limatula,	"	{ Egeria triangulata,	Lea.
fragilis,	"	Bucklandii,	"
Corbis lamellosa,	Lam.		
undulata,	Conrad.		
distans,	"		
Tellina papyria,	"		
alta,	"		
ovalis,	"	Egeria ovalis,	"
plana,	"	plana,	"
scandula,	"		
Raveneli,	"		
Sillimani,	"		
Lucina pandata,	"	L. compressa,	"
symmetrica,	"	L. rotunda,	"
papyracea,	Lea.		
subvexa,	Conrad.		
dolabra,	"	Astarte recurva,	"
alveata,	"	L. lunata,	"
carinifera,	"	L. cornuta,	"
pomilia,	"	L. impressa,	"
Mysia unguлина,	"	{ Astarte unguлина,	Conrad.
nitens,	"	Egeria rotunda,	Lea.
inflata,	"	nitens,	"
	"	inflata,	"
Cytherea æquorea,	"	C. Hydii,	"
Mortoni,	"		
discoidalis,	"	C. trigonata,	"

NAMES.		SYNONYMES.	
Cytherea Poulsoni,	Conrad.	C. globosa,	Lea.
subcrassa,	Lea.		
Nuttali,	Conrad.		
perovata,	"	C. comis,	"
Hydana,	"	Gratelupia Moulinsii,	"
Astarte tellinoides,	"	} A. Nicklinii,	"
		} A. sulcata,	"
Stalagmium margaritaceum,	Conrad.	Myoparo costatus,	"
Corbula oniscus,	"		
nasuta,	"	C. Murchinsonii,	"
Mactra prætenuis,	"	M. Alabamiensis,	"
decisa,	"		
parilis,	"	M. pygmæa,	"
Erycina æquorea,	"	Mactra Grayii,	"
rectilinearis,	"		
Amphidesma linosa,	"		
tellinula,	"		
profunda,	"		
Lutraria papyria,	"		
lapidosa,	"		
Psammobia filosa,	"		
eborea,	"		
Fistulana elongata,	Desh.		
Balanus ostrearum,	Conrad.		
Serpula ornata,	Lea.		
squamulosa,	Conrad.		
Dentalium thalloides,	"	D. alternatum,	"

The Middle Tertiary includes a number of deposits which differ considerably from each other in the relative number of extinct and existing species, and their age is not clearly ascertained. It may include fossils both of the Miocene and older Pliocene periods; to the latter, some deposits certainly belong. I formerly applied the term Lower Tertiary to what has been called the Plastic clay of this country; it is now used to designate the oldest of the fossiliferous tertiary beds.

## ADDITIONAL OBSERVATIONS.

JUNE, 1835.

### I.

A further examination and comparison of the fossils of the preceding Synopsis, has enabled me, with the assistance of Mr. CONRAD, to separate the Cretaceous deposits of America into three great divisions, each possessing common characters, together with others which are sufficiently distinctive. For the sake of convenience, these divisions may be called the Upper, Medial and Lower.

The *Upper Division* embraces the Nummulite Limestone of Alabama, (p. 22,) and the Cretaceous strata of South Carolina, (p. 20.) Its characteristic fossils are, Nummulites Mantelli, Terebratula lachryma, Pecten membranosus, P. Poulsoni, Plagiostoma dumosum, Balanus peregrinus, Nautilus Alabamensis, Scutella Rogersi, S. Lyelli and Echinus infulatus. To this division Mr. Conard\* refers the gigantic remains of the *Basilosaurus*. [Harlan.]

The *Medial division* is partially seen at Wilmington, North Carolina, (p. 20,) and to a considerable extent in New Jersey, (p. 16.) Its characteristic fossils are, Spatangus parastatus, Nucleolites crucifer, Ananchytes fimbriatus, Teredo tibialis, Scalaria annulata, Belemnites ambiguus, and Vermetus rotula. It also contains the remains of crocodiles and sharks.

\* Fossil Shells of the Tertiary Formation of N. America, p. 35.

## ADDITIONAL OBSERVATIONS.

The *Lower Division* embraces the vast Ferruginous deposits of this country. Of its numerous fossils already described, the following may be considered as *uniformly* characteristic: *Belemnites Americanus*, *Exogyra costata*, *Gryphæa convexa*, *Ostrea falcata*, *Ammonites Delawarensis*, *Hamulus onyx*, &c. &c. which are distributed from New Jersey to Arkansas. This division also embraces the remains of Saurians and Fishes. (p. 27.)

## II.

I have received, through Dr. Mantell, a note from M. Agassiz, in reference to the teeth of Fishes figured on Plates XI. and XII. of this work. M. Agassiz observes, that so far as he can decide from the drawings, these remains may be identified as follows:

Pl. XI. Fig. 6. *Galeus pristodontus*.

“ Fig. 11. *Lamna acuminata*.

“ Fig. 4. ——— Mantelli.

“ Fig. 1. ——— obliqua.

“ Fig. 5. ——— lanceolata.

“ Fig. 2 and 3. *Lamna plicata*.

Pl. XII. Fig. 3 and 5. *Carcharias lanceolatus*.

“ Fig. 4. *Carcharias megalotis*.

“ Fig. 2. ——— polygurus.

Mr. Mantell adds the highly interesting facts, that of these species, the *Galeus pristodontus*, *Lamna acuminata* and *Lamna Mantelli*, are also found in the chalk of England; that the *Saurocephalus lanciformis* and *S. Leanus*

#### ADDITIONAL OBSERVATIONS.

are not Saurians, but *Fishes* ; and that both species have also been found in the chalk of Sussex.

#### III.

GALT. The bed of clay bearing this name, and embraced in the cretaceous deposits of the South of England, has been detected, by Mr. Conrad, near Erie, Alabama. The English galt is characterized by the *Inoceramus sulcatus* ; the American stratum also contains a shell of the same genus, but the specimen in my possession is too imperfect for description. The *Hamulus onyx* is also characteristic of this clay.

#### IV.

During a recent excursion among the arenaceous strata of New Jersey, by Mr. Conrad and myself, we found the *Terebratula lachryma*, (hitherto observed only in the Upper division,) in the argillo-ferruginous sand at Woodward's farm, in Monmouth county. The same locality furnished us with a new species of *PLAGIOSTOMA*.

*Plagiostoma echinatum*, (S. G. M.) Shell ovate, very ventricose, with a few concentric furrows on the inferior half; ribs numerous, narrow, aculeated above; six or seven of the costæ armed with slender oblique elongated spines.

#### V.

The ferruginous sand has lately been traced from Arneytown to Tinton, in Monmouth county, N. J. ; at the latter

#### ADDITIONAL OBSERVATIONS.

place it is indurated, being a coarse grained sandstone, replete with *Gryphæa mutabilis*, *Ostrea falcata*, and other characteristic fossils; remains of a Linnæan *Cancer* and casts of *Alcyonia* are remarkably abundant. This rock forms the bed of the small creek at the village of Tinton, and, terminating abruptly on the west, affords a fall of sixteen feet; the whole elevation is twenty-seven feet. Three strata are observed in a section of the rock, with no difference in their fossil remains; but the intermediate stratum is not so highly charged with oxide of iron, and is less indurated than the others. Six miles from Tinton, and within three miles of Long Branch, Mr. Conrad discovered casts of a group of shells which fully prove the deposit to be a green sand of the Eocene period. He has also discovered a siliceous rock of the same age, a few miles south-east of Salem, on which a thin bed of Miocene marl reposes.

#### VI.

In addition to the species which have been given in the table as common to the Upper division of the Cretaceous series and the Eocene, we have lately observed the *Pecten Poulsoni* from the latter formation, at the Walnut Hills, Miss. Mr. Conrad detected the *Gryphæa vomer* in the Eocene at Upper Marlborough and Piscataway, Md.

## EXPLANATION OF THE PLATES.

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### PLATE I.

- Fig. 1. *Belemnites Americanus*,  
 2. Transverse section of the same fossil,  
 3. Same, subfusiform,  
 3-a. Variety of the same species? Obscurely chambered, and obtuse at the apex,  
 4. *Belemnites*? *ambiguus*,  
 5. Transverse section magnified,  
 6. *Baculites ovatus*,  
 7. Transverse section of the same,  
 8. Same species,  
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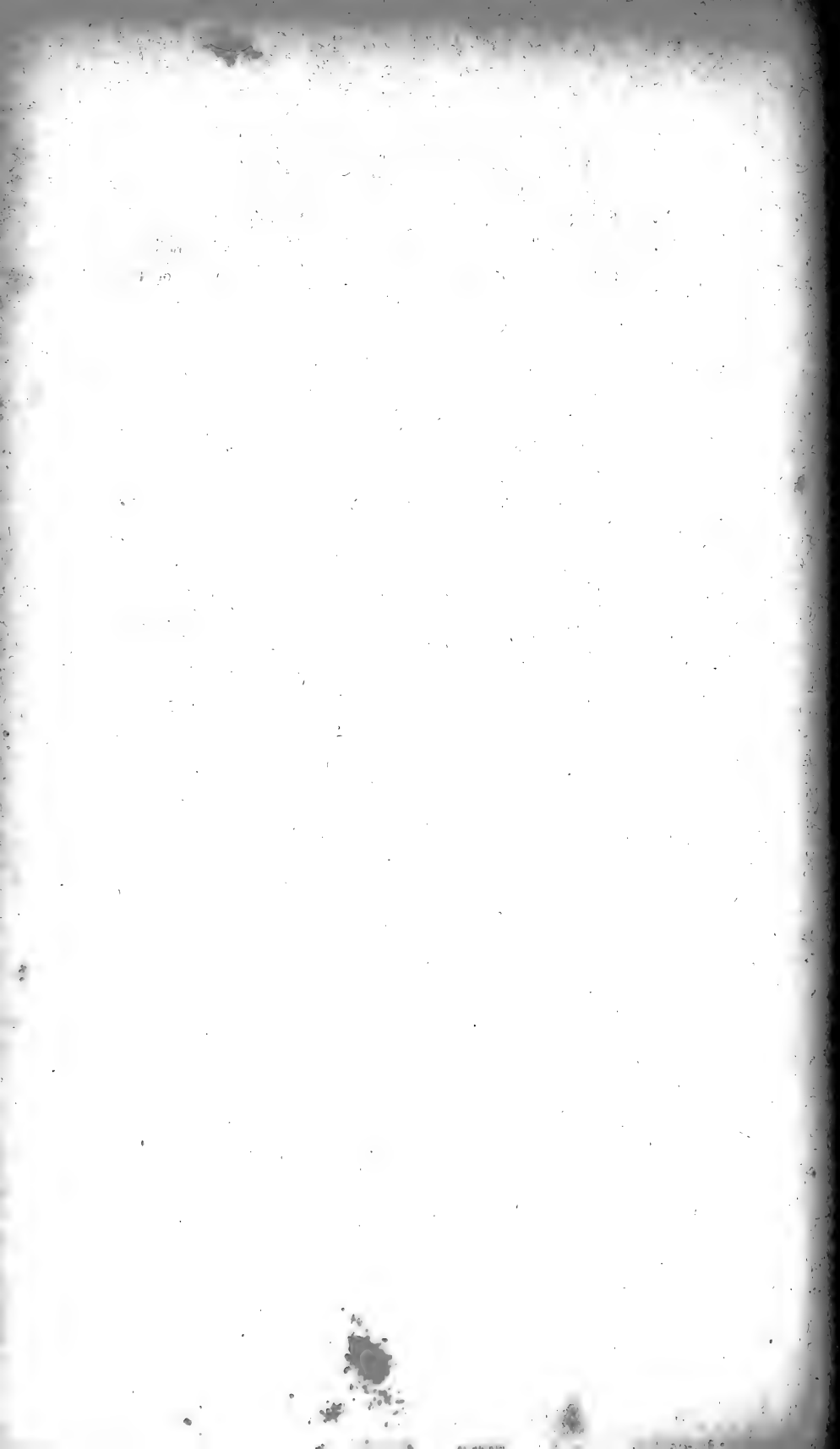
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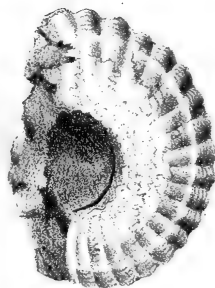
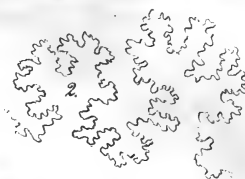
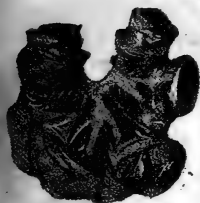
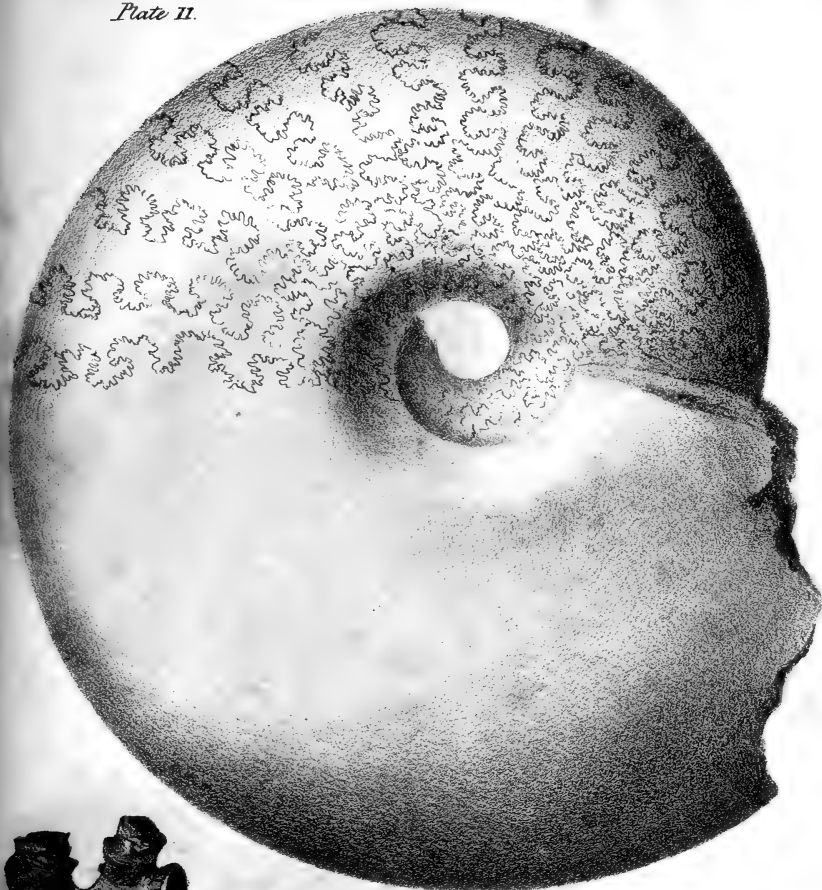
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**ERRATUM.**

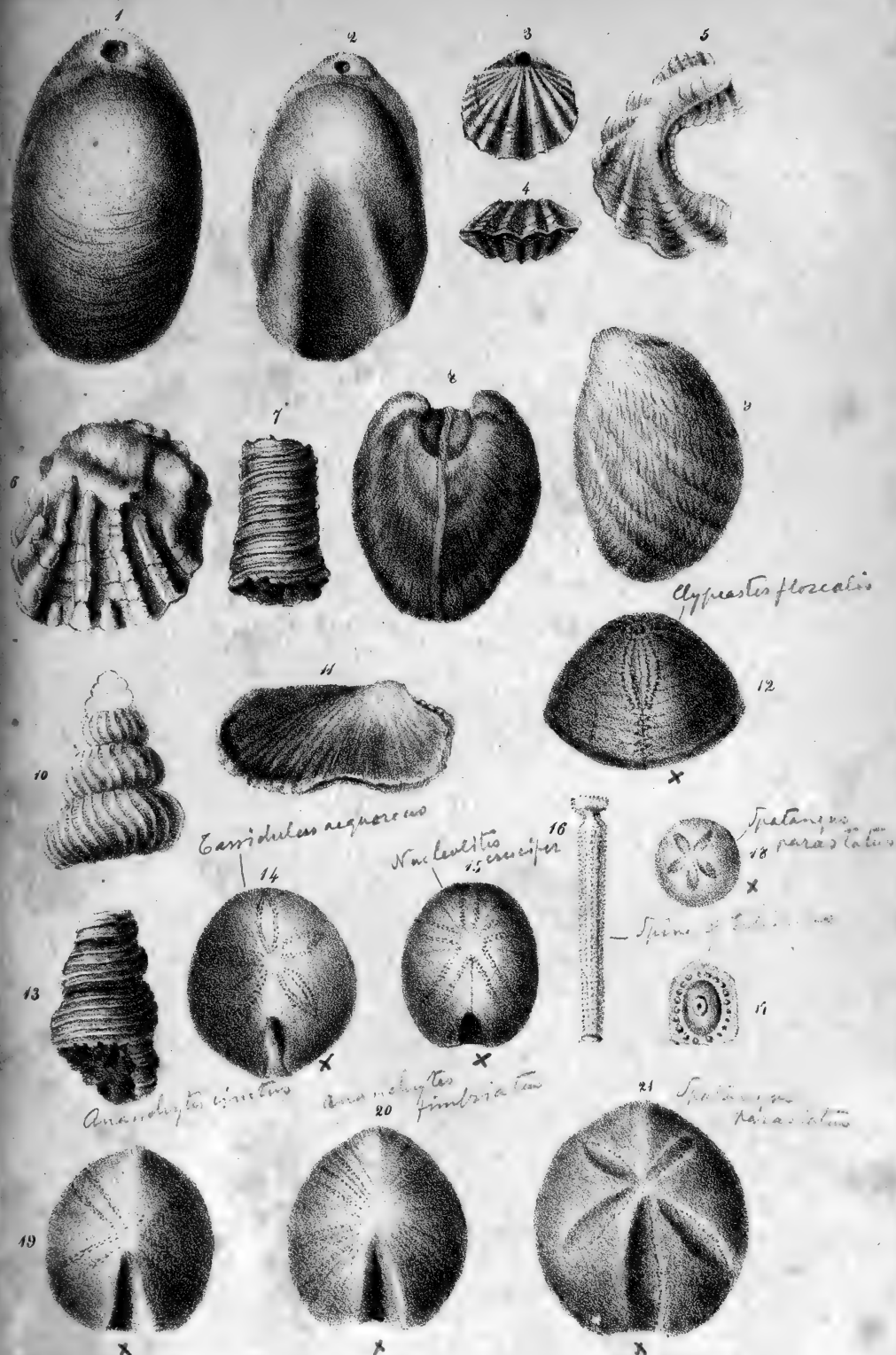
At *A. syrtalis*, page 40, for "pl. xiv, fig. iv," read pl. xvi, fig. iv.









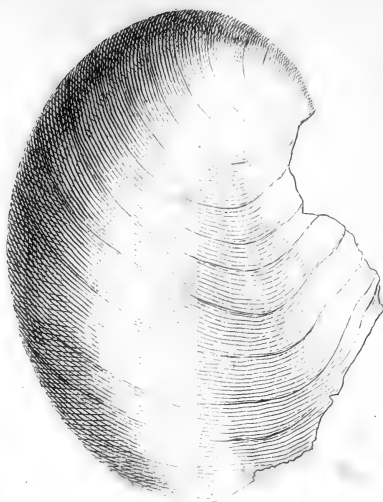




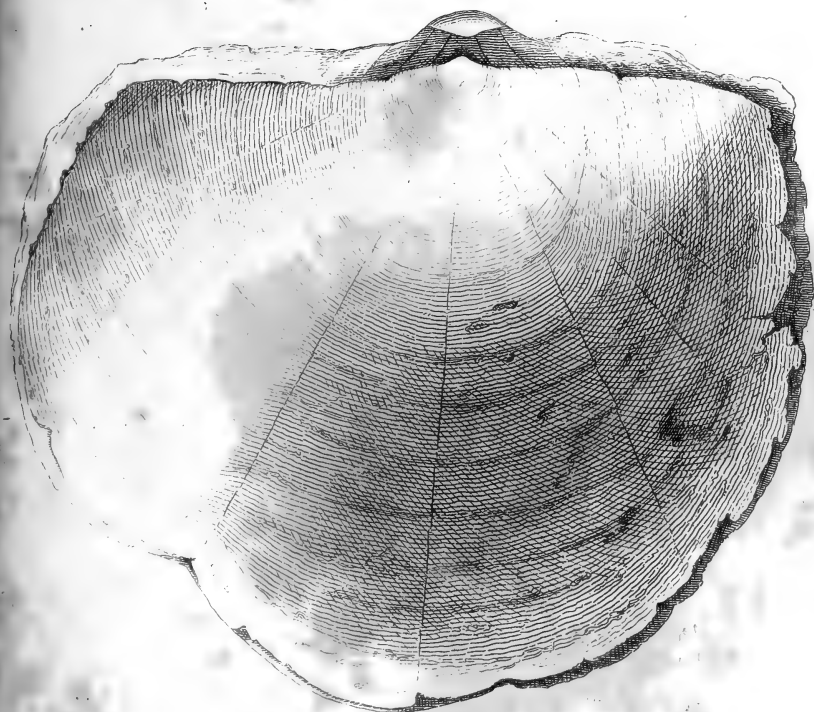
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*





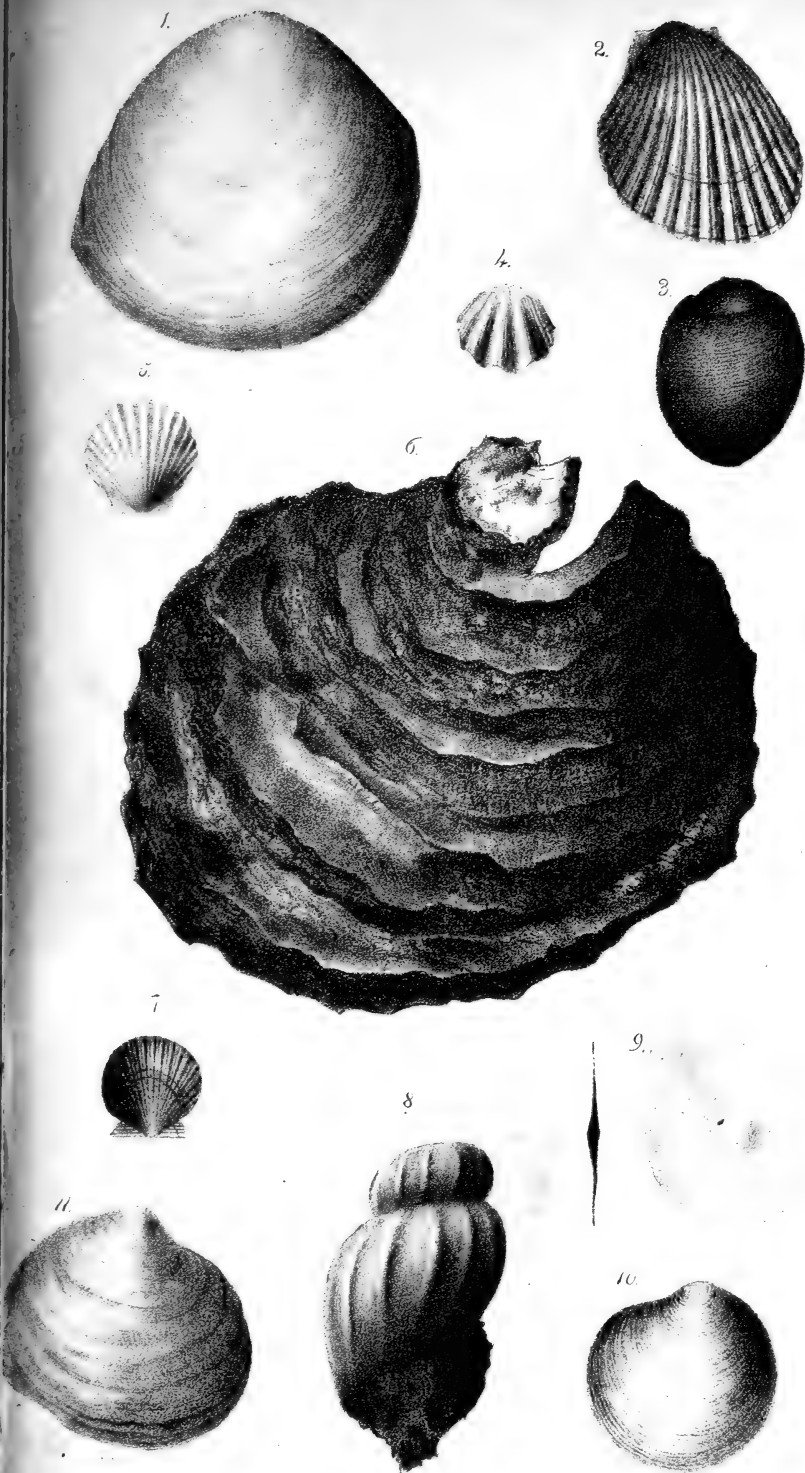




Fig. 1.



Fig. 3.

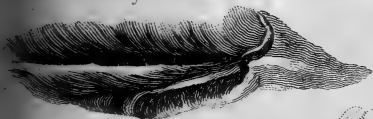


Fig. 4.

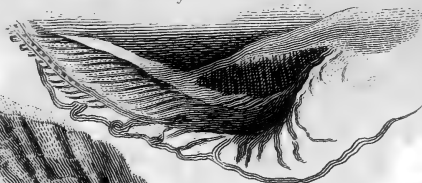


Fig. 2.





*Scaphites Cuvieri*

Fig. I.



*Crepidula costata*

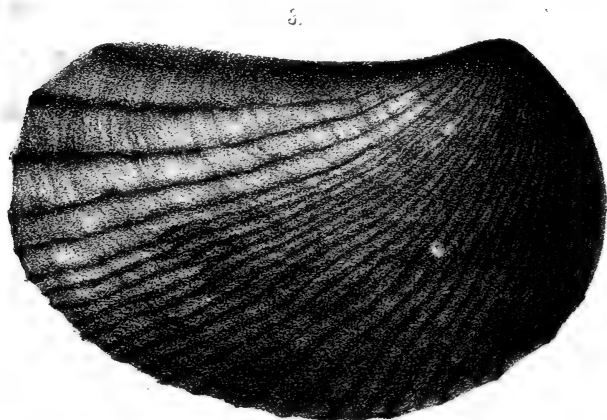
Fig. 2.



Fig. 3.



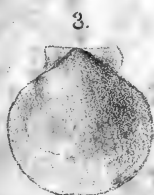






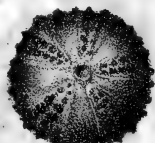
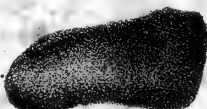






*Spatangus unguis*

*Scutella Lyelli*



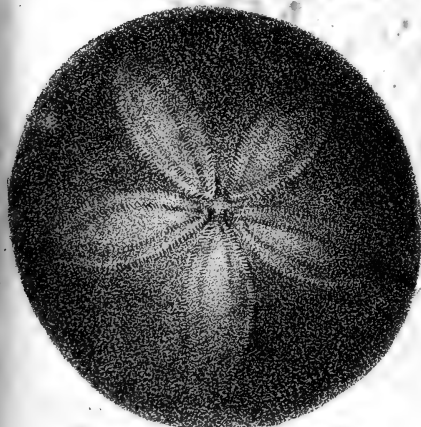
*Clypeaster geometricus*

*Delamora*

*Echinus inflexus*



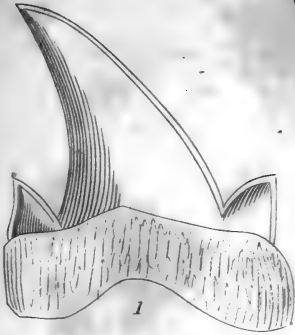
*Cidarites diatremum*



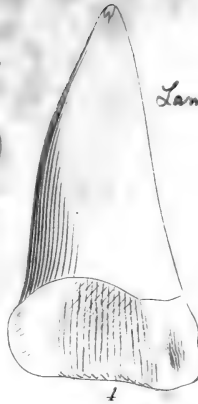
*Clypeaster florealis*



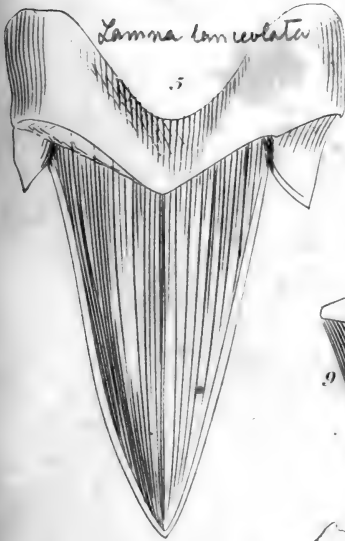




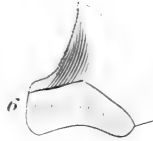
*Lamna plicata*



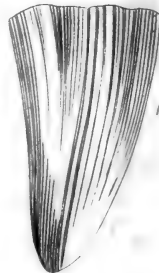
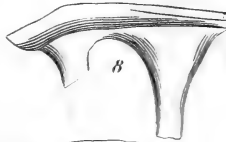
*Lamna mantelli*



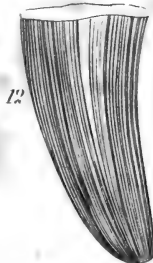
*Lamna lanceolata*



*Galus pristodontus*



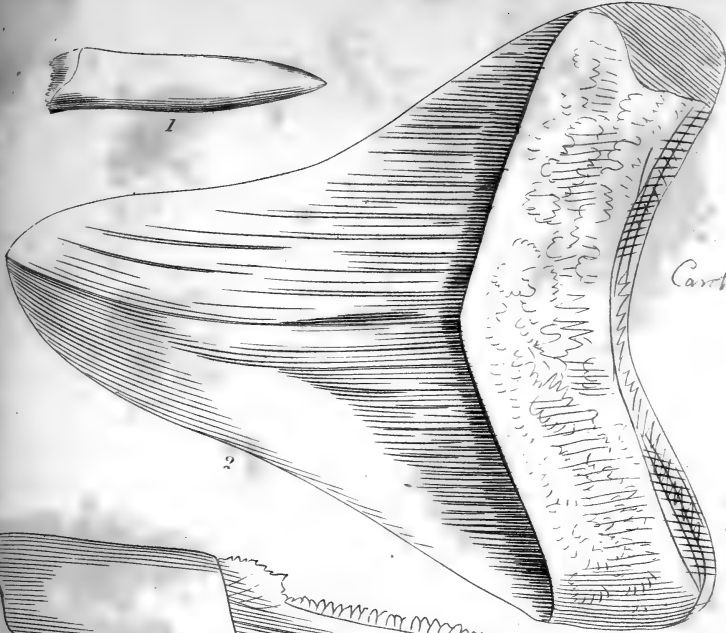
*Lamna acuminata*





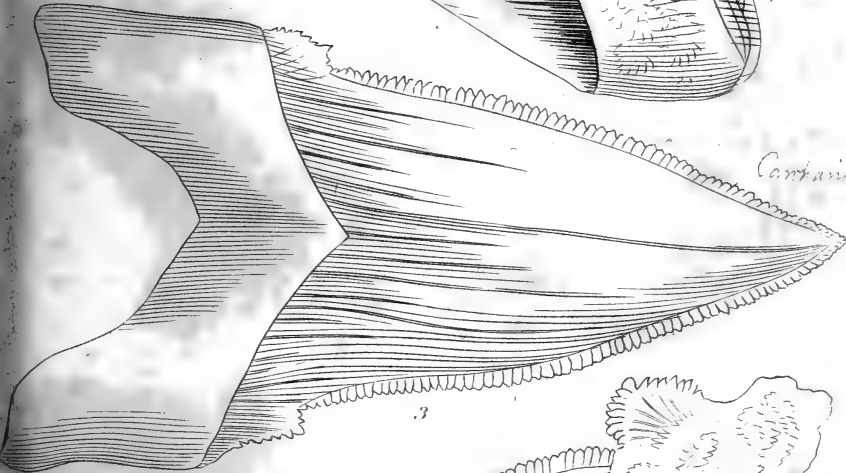


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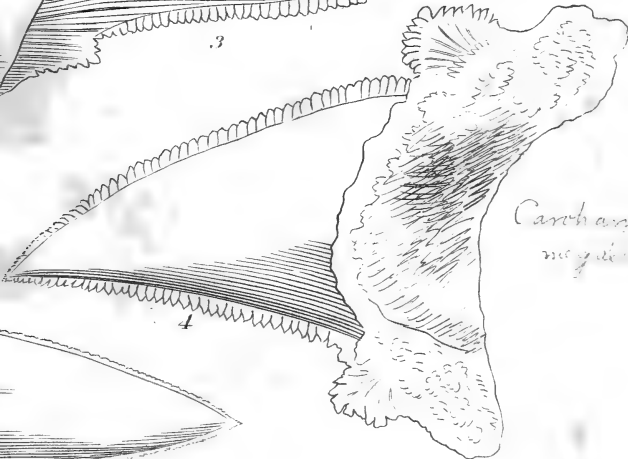
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*Carbarias polygurus*



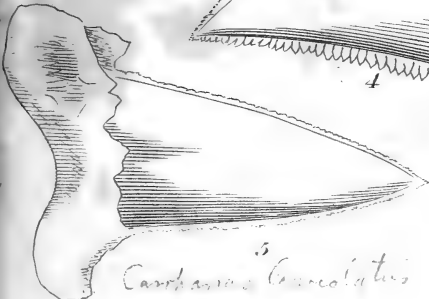
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*Carbarias lanceolatus*



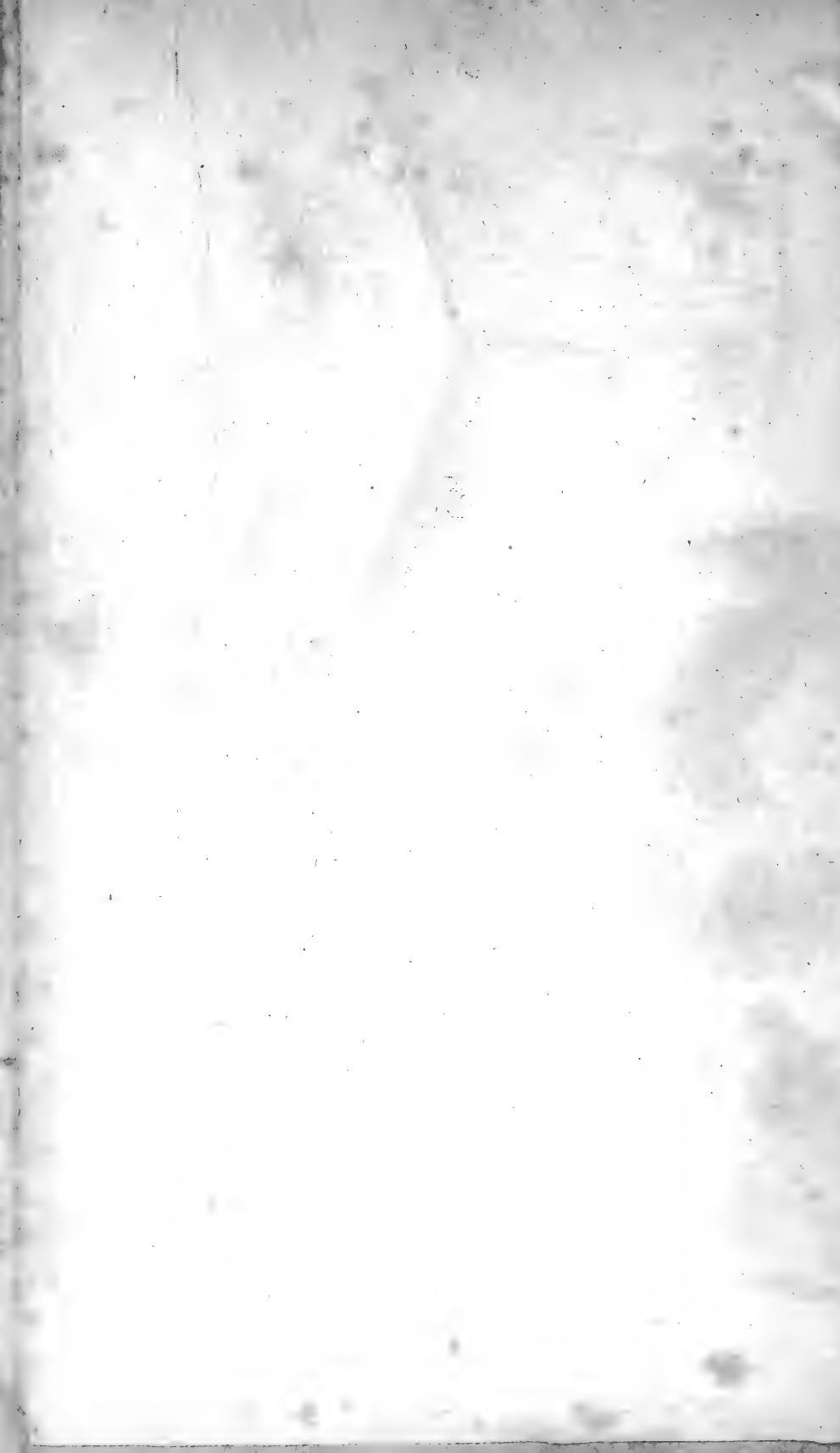
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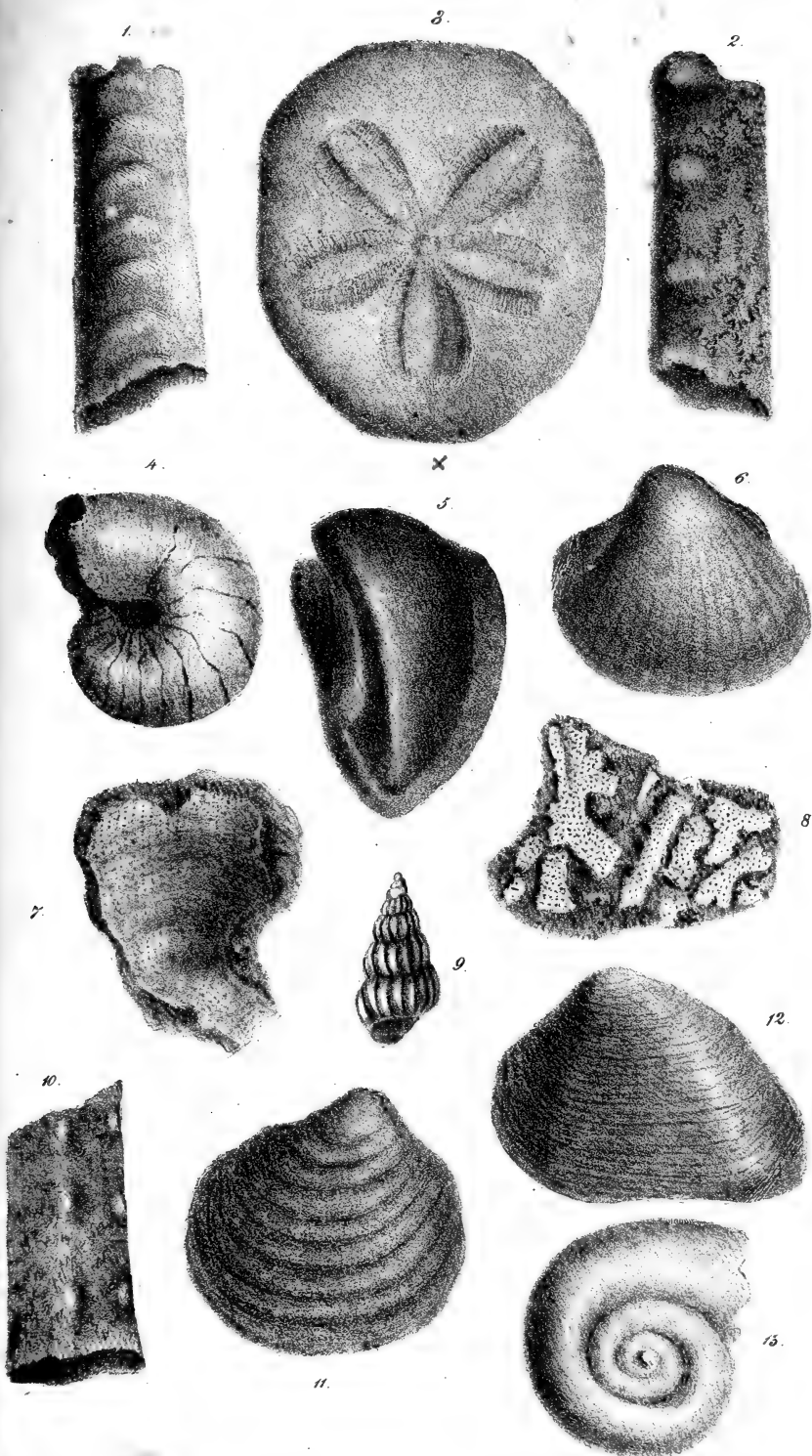
*Carbarias  
neglectus*

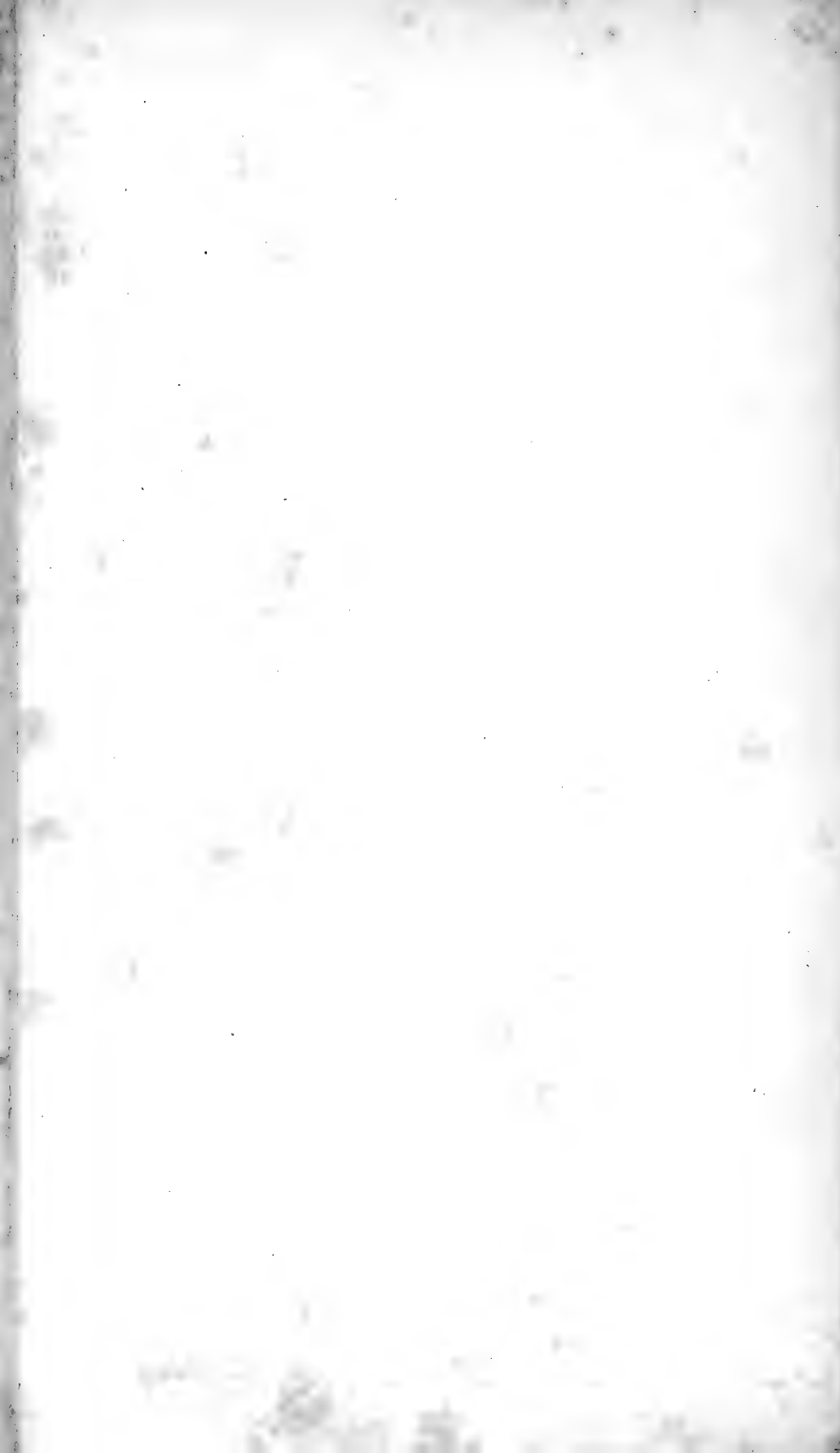


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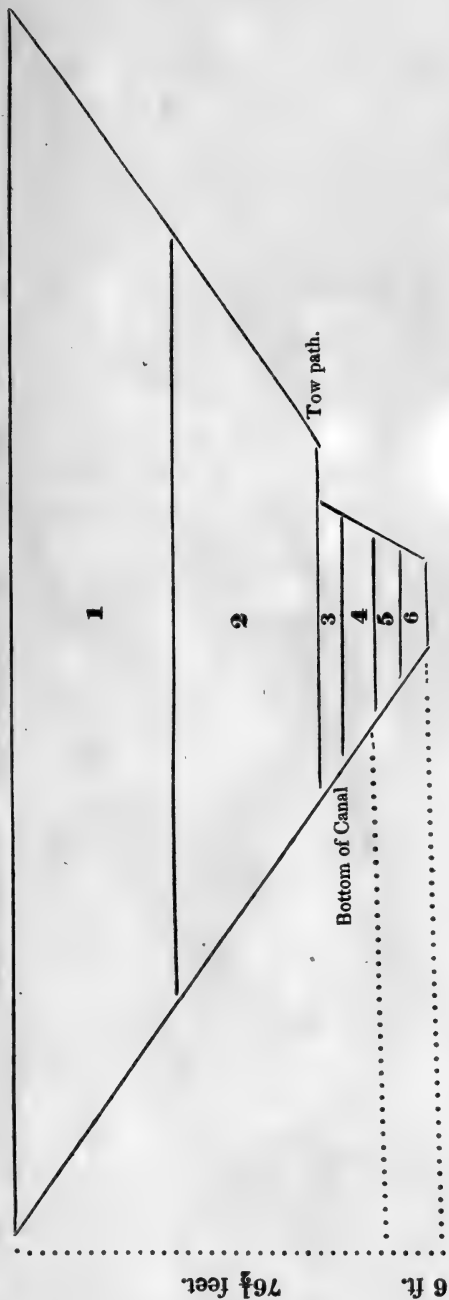
*Carbarias lanceolatus*





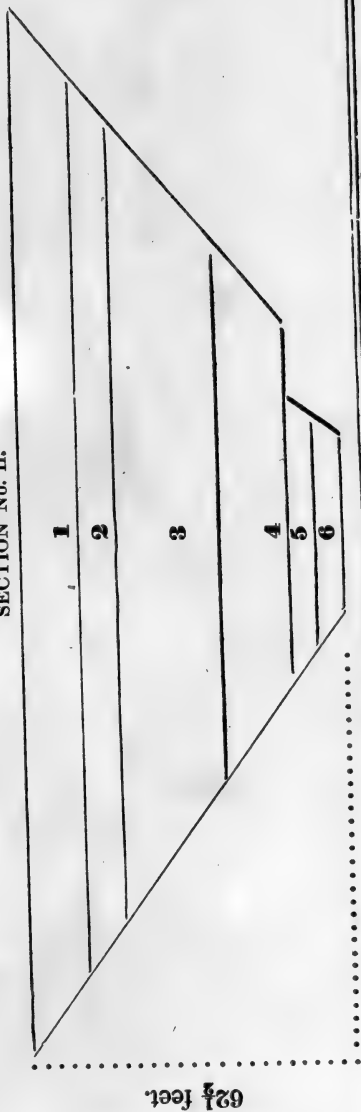


# CHESAPEAKE AND DELAWARE CANAL.—SECTION No. I.

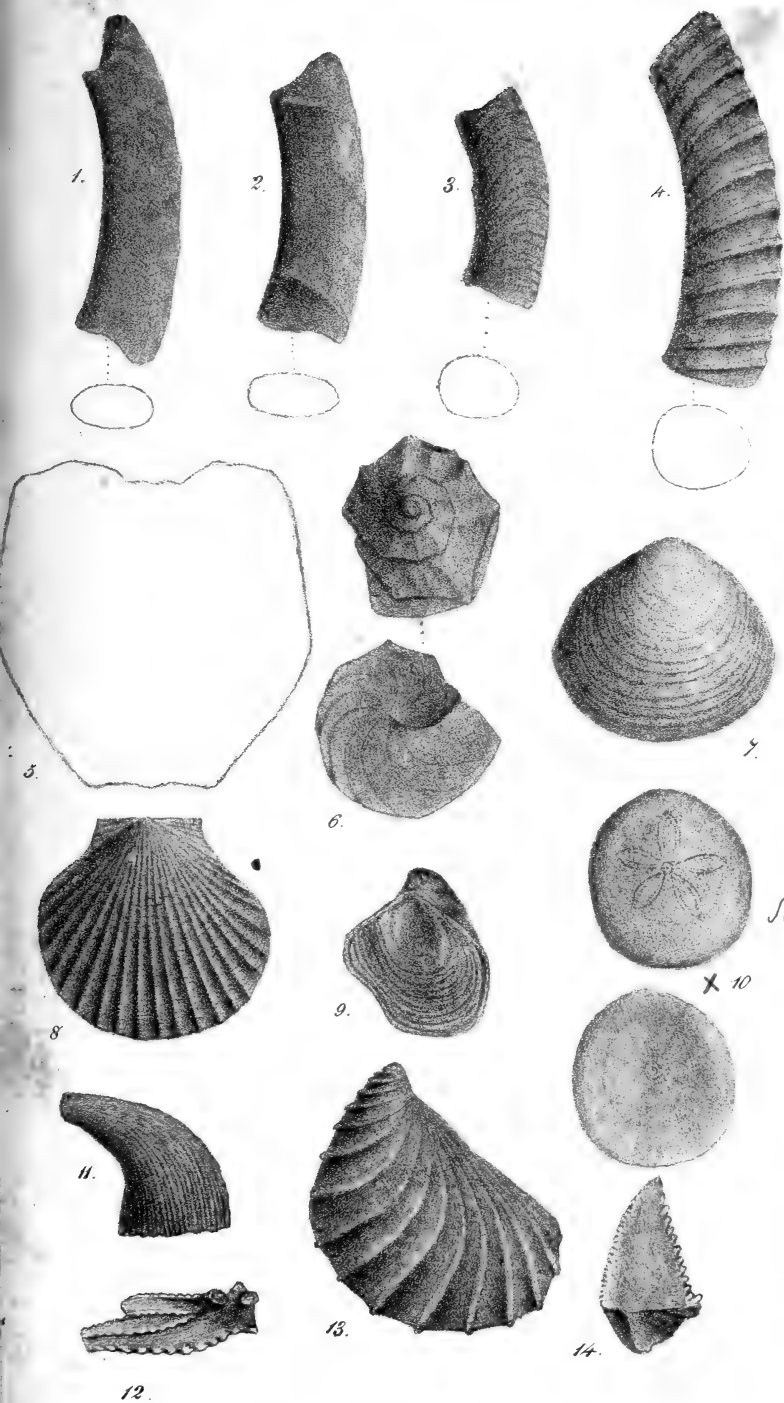


Pl. 14.

## SECTION No. II.



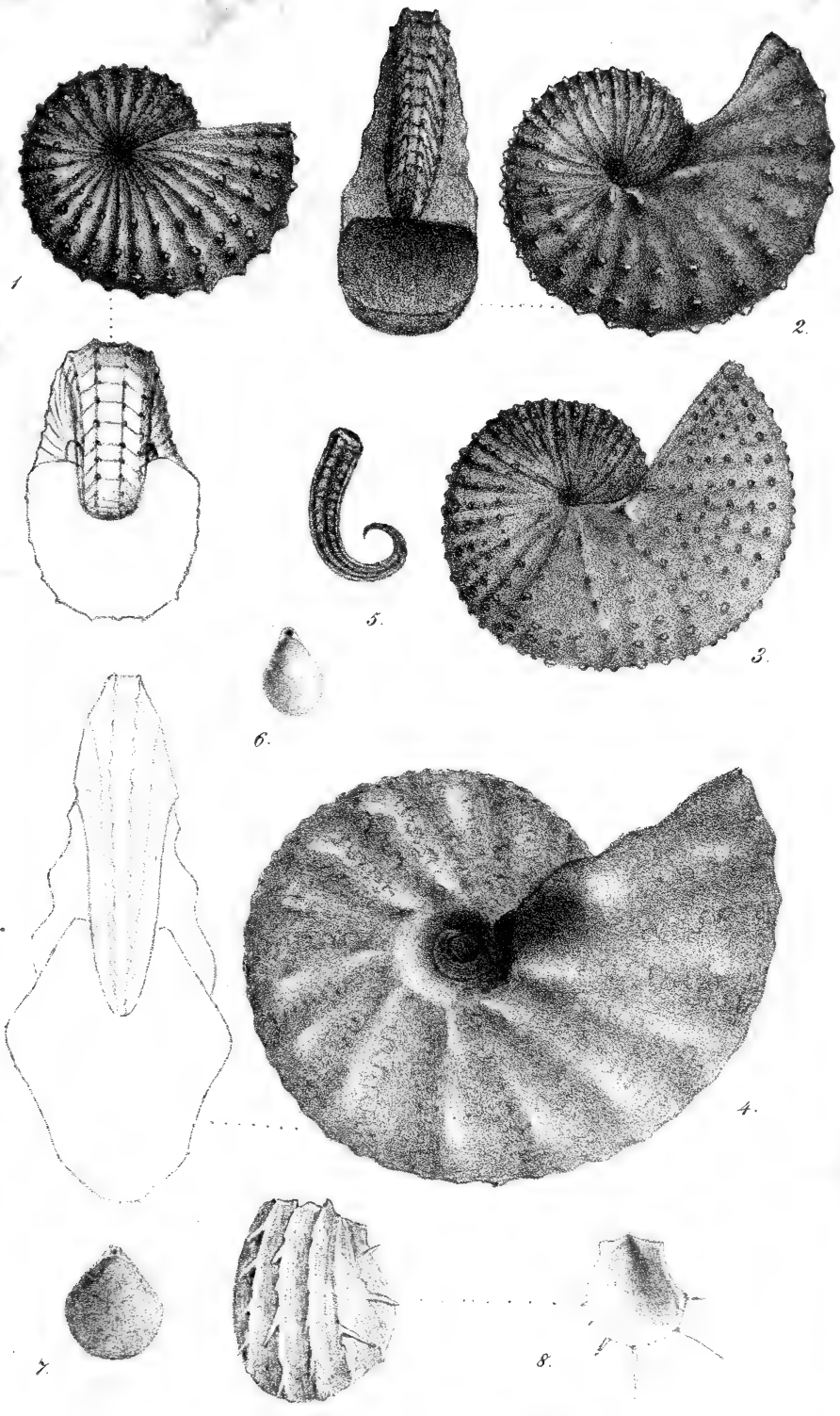




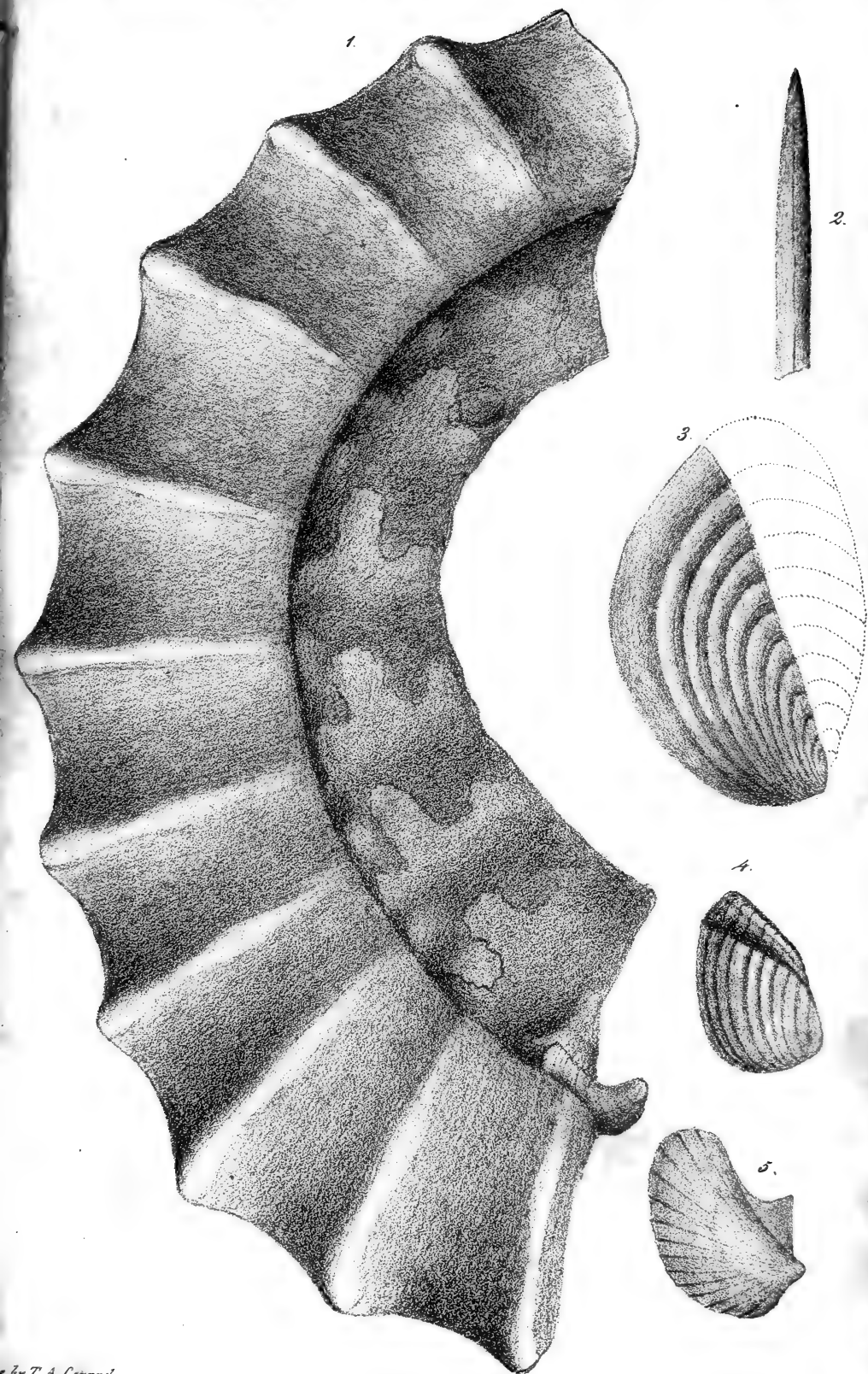
*Scutella crustuloides*  
South. Green. m.

X 10

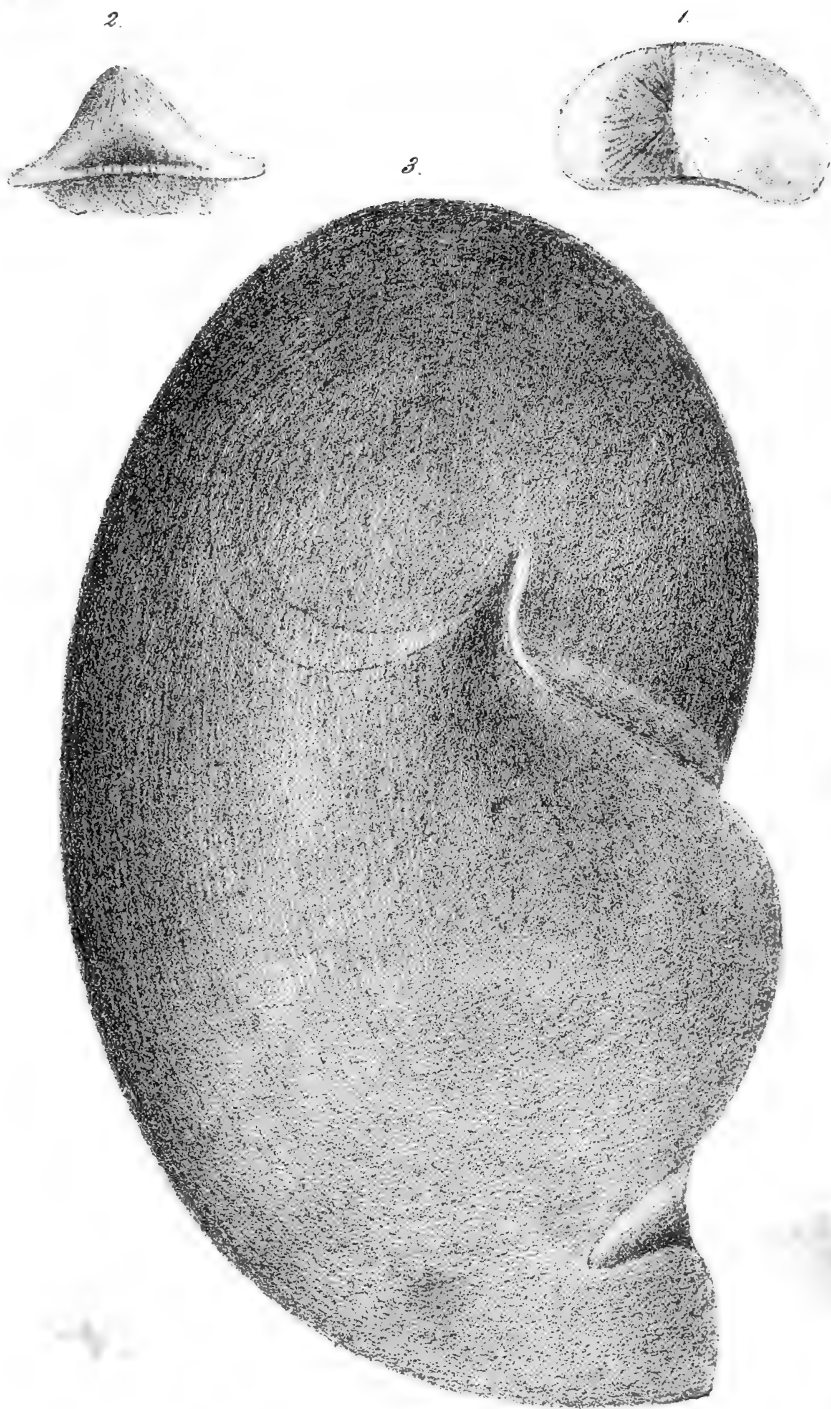




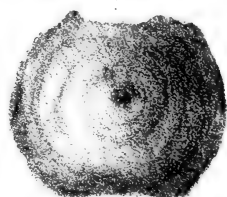
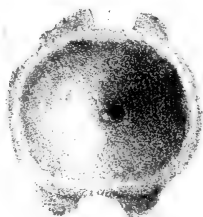
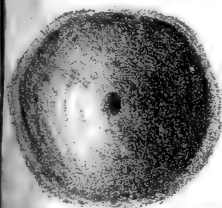
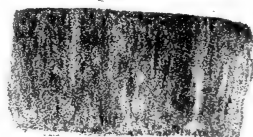
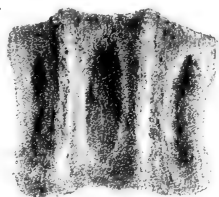
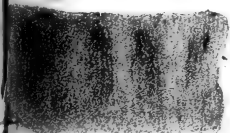
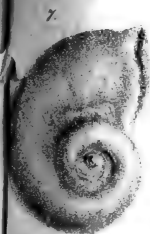
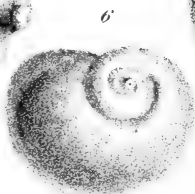
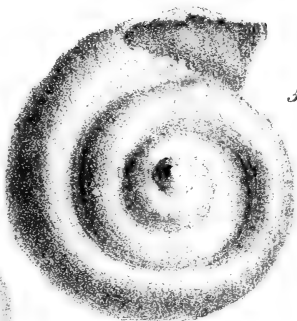
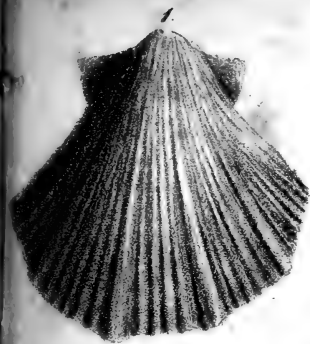






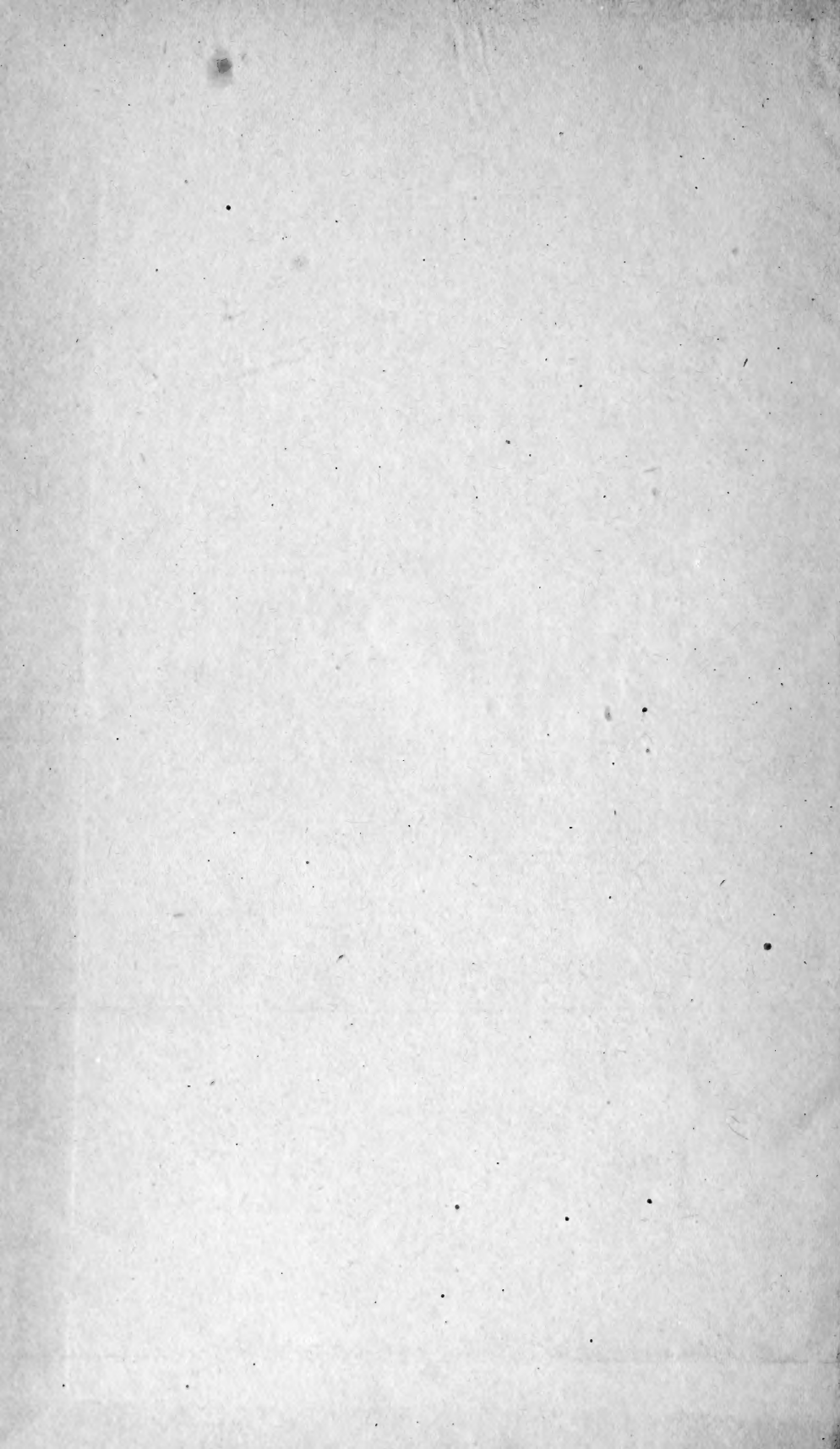












the modelers are 10 million to 20 million dollars (30 to 60 percent) of the cost of the model. In the event of an accident, the modelers are more likely to be sued than the modelers. The modelers are more likely to be sued than the modelers.

view of these facts, it will be evident that the year began in the city a most fruitful one, in the social, moral and successful progress. A summary of the magnitude of cases reveals, however, that all these features being noticeable; and that since the last year some of the State's abuses have been removed.

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Massachusetts  
Michigan  
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regulation of the Government is not received  
on numerous amounts, \$72,000, \$81,000,  
\$100,000, \$125,000, \$150,000. It has been  
said, \$25,000, \$40,000, \$50,000. It will therefore be  
seen, that interest has paid all its expenses,  
be it necessary to the Government.

pleasing stories from the  
delicious love. The

and one billion dollars worth of insurance companies being taken in for the sake of a few million dollars.

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