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NOTES FROM THE GEOLOGICAL LABORATORY.

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CONTENTS.

Description of the Geological Excursions made during the Spring of 1895. By W. B. CLARK, - - - - -	1
Two New Brachiopods from the Cretaceous of New Jersey. By W. B. CLARK, - - - - -	3
Contributions to the Eocene Fauna of the Middle Atlantic Slope. By W. B. CLARK, - - - - -	3
Additional Observations upon the Miocene (Chesapeake) Deposits of New Jersey. By W. B. CLARK, - - - - -	6
Notes on Some Flattened Garnets from North Carolina. By E. B. MATHEWS, - - - - -	8
A Contribution to the Neocene Corals of the United States. By H. S. GANE, - - - - -	8
The Spotted Slates Associated with the Sioux Quartzite. By S. W. BEYER, - - - - -	10
The Cretaceous Foraminifera of New Jersey. By R. M. BAGG, - - - - -	10
The Volcanic Series of Fox Islands, Maine. By G. O. SMITH, - - - - -	12
A Preliminary Note on the Geology of Massanutten Mountain in Virginia. By A. C. SPENCER, - - - - -	13
Preliminary Discussion of the Geology of the Bordentown Sheet of the Geologic Atlas of the United States. By G. B. SHATTUCK, - - - - -	14
The Discovery of Fossil Tracks in the Newark System (Jura-Trias) of Frederick County, Md. By J. A. MITCHELL, - - - - -	15
Note on the Cretaceous Formations of the Eastern Shore of Maryland. By D. E. ROBERTS, - - - - -	16
Notes on the Paleontology of the Potomac Formation. By ARTHUR BIBBINS, - - - - -	17

Report on the Work of the Geological Department during the past year, - - - - -	20
Report of the Maryland State Weather Service, - - - - -	21
Announcements, - - - - -	21

Description of the Geological Excursions made during the Spring of 1895. BY WILLIAM B. CLARK.

In accordance with the established custom of the Geological Department one or more extended geological excursions are made each spring to visit either the Cretaceous-Tertiary series of the Coastal Plain or the Paleozoic formations of the Appalachian Mountains.

During the month of May of the present year two such expeditions were undertaken—the first to examine the section of fossiliferous strata exposed along the banks of the Potomac River, and the second to the Natural Bridge, Luray Caverns and Massanutten Mountain in the Appalachian region of Virginia.

There were twenty-one altogether who took part in these excursions.

FIRST EXCURSION TO THE COASTAL PLAIN.

The first expedition, which was made upon a small steamboat specially engaged for the purpose, embraced an examination of the Cretaceous-Tertiary formations for nearly fifty miles along the banks of the Potomac River from Washington southward. In this area of the Coastal Plain are found exposed representatives of all the formations from the Cretaceous to the Pleistocene, no other section affording a more complete sequence of the different members of the series, or more highly fossiliferous strata. Extensive collections were made at many points.

The Cretaceous.—The Cretaceous deposits have been divided into several formations, which, with the exception of the lowest member, find their more complete development in the area to the northward, especially upon the eastern shore of Maryland and in New Jersey.

The lowest member known as the "Potomac formation," from its extensive development in the Potomac region, is well exhibited upon the Maryland bank at Fort Foote and at the base of the bluff at Fort Washington; while upon the Virginia side numerous exposures are found all along the shore as far as Aquia Creek. The formations consist for the most part of sands and clays—the latter highly colored and variegated, and characterizing the upper beds. The life is largely reptilian and plant, few molluscan

earlier described, it is itself composed of higher members of the Paleozoic series. Subjected to the deformation characteristic of this part of the Appalachian region, in which extensive folding and some faulting are found, it affords a circumscribed district for study, that has few equals. As this area has been assigned to Mr. Spencer for investigation, he will present in a subsequent article a preliminary account of its general features, so that only a few words need be given here.

The *Shenandoah limestone*, above mentioned, is overlain in turn by the *Martinsburg shale* (Hudson River), and the *Massanutten sandstone* (Medina), the only formations examined by the party in the section made from Luray to Newmarket, although in other portions of the region these divisions are succeeded by the *Rockwood formation* (Clinton), the *Lewiston limestone* (Lower Helderberg), the *Romney shales* (Hamilton), and probably also the *Jennings formation*.

Upon the return journey a half day was spent in examining the geological formations in the vicinity of Harper's Ferry, the ascent of Maryland Heights being made by the party.

Two new Brachiopods from the Cretaceous of New Jersey. By WILLIAM B. CLARK.

The Cretaceous deposits of New Jersey have afforded an abundant fauna in which several species of Brachiopoda have been recognized. One of these, the *Terebratulina harlani*, is a common form, and the most characteristic fossil of the Rancocas formation (middle marl bed) throughout the northern Atlantic coastal plain.

The two species below described are of interest as the first representatives of the genus *Cistella* reported from American Cretaceous strata. They come from the upper portion of the Rancocas formation in the calcareous beds overlying the *Terebratulina harlani* zone. All the specimens thus far obtained were found in the pits on the south bank of Rancocas creek about one-half mile below Vincentown. This same locality has also afforded large numbers of shells of Echinodermata, Bryozoa, and Foraminifera.

Cistella beecheri, n. sp.

PLATE, FIG. C.

Shell small, subcircular to subpentagonal in outline, convex, longer than wide, with greatest width along the hinge-line; surface covered with a few prominent plications, in the largest forms generally eight in number, gradually decreasing in size toward the sides; wide, deep sinus generally occupies the median line, although an intercalated plication appears in some of the larger forms.

Ventral valve full; beak moderately high, somewhat attenuate; area linear, triangular, reflexed; foramen large.

Dorsal valve full, about two-thirds length of shell; septum prominent, but most of the brachial structure is destroyed.

The measurements of the specimens obtained show the length to vary from 1 mm. to 3 mm., and the width from .75 mm. to 2.25 mm.

The mature forms are more ventricose, with a somewhat greater width in the cardinal region, more elevated and curved beaks, and stronger plications upon the surface.

Cistella plicatilis, n. sp.

PLATE, FIG. D.

Shell moderate sized, orbicular, slightly convex, longer than wide; surface with a considerable number of plications, ten or twelve on dorsal valve, together with a few short intercalated ones near the margin.

Dorsal valve slightly inflated; septum prominently developed.

The dimensions of the single specimen of the dorsal valve obtained are about 4.5 mm. both in length and width.

The species is quite distinct from *Cistella beecheri*.

Contributions to the Eocene Fauna of the Middle Atlantic Slope. By WILLIAM B. CLARK.

Attention has been directed to the Tertiary geology and paleontology of the Middle Atlantic slope since the very beginning of geological investigation in this country, and although the relations of the deposits were not altogether comprehended by the earlier geologists, yet the observations recorded show an appreciation of many of the more difficult problems involved. Even at a relatively early date an older and a younger Tertiary were recognized, the former, from the first, being correlated, with few exceptions, with the Eocene of England and the Continent of Europe, while attempts were even made to find its exact equivalent in one or another of the local formations of that portion of the world.

After the American Eocene strata had received detailed examination in the various sections of the country, and local divisions had been proposed, attempts were made to establish their equivalency. By common consent the diversified and extensive deposits of the Gulf area came to be regarded as the type for the eastern border region, and the various Eocene deposits of the Atlantic coast States were assigned to a position in this series, although very different limits were given by the various authorities. By some the Middle Atlantic coast deposits have been held to represent a single minor division, while others have regarded them as equivalent to a larger portion of the Gulf series. The latter conclusion seems to the writer, after consideration of both the paleontological and geological data, to be the only tenable position. In the past, too little attention has been given to the geological phenomena, while, at the same time, the knowledge of the fossils has been wholly insufficient for a proper interpretation of the faunal characteristics of the formation.

The Geological Criteria.—The lithological and stratigraphical characteristics of the Eocene in the Middle Atlantic slope afford some important criteria for the correlation of the strata. To begin with, the homogeneous nature of the deposits is a characteristic feature, indicating conditions throughout the period of Eocene deposition, undisturbed by important physical changes. Again, the fact that the strata are so largely made up of secondary materials shows that the position of accumulation was in the vicinity of a coast reached by no large rivers bearing sediment, while at the same time sufficiently removed from the coast line to be unaffected by shore conditions. It is further evident that these deposits, which are so largely glauconitic, were accumulated with exceeding slowness, as has been shown in the case of the formation of greensands upon the beds of existing seas.

Now when we compare these conditions of accumulation in the Middle Atlantic slope with the conditions that prevailed in the Gulf region, marked differences appear. In the latter area numerous rivers, draining the interior of the continent, discharged great quantities of material throughout Eocene time, making the deposits highly diversified. Instead of the green sands and greenish and black clays of the Middle Atlantic slope, which no longer to any large extent characterize the strata, are found coarser beds of sand and clay, often partly calcareous, which give every indication of rapid accumulation. To compare, therefore, the 150–200 feet of green sands and clays of the Middle Atlantic slope with one or two subdivisions of hardly equal thickness in the Gulf region would, even upon stratigraphical grounds without the aid of fossils, hardly be attempted. The strata of the Middle Atlantic slope must be represented in the Gulf by deposits many times their thickness.

The Paleontological Criteria.—When we come to a full examination of the faunal characteristics we find likewise that very different conclusions must be reached from those hitherto held. The few fossils collected up to the present time have come from a horizon low down in the formation, so that a very inaccurate idea of the fauna has been obtained. Scarcely 25 species were hitherto recognized with certainty, while nearly 125 have been obtained by the writer and those associated with him in this investigation. Although many of the species are apparently restricted to certain horizons, others range throughout the formation. Of those found more largely in the lower beds (which may be designated the *Aquia Creek Stage*), may be mentioned *Turritella mortoni*, *T. humerosa*, *Panopaea elongata*, *Cytherea ovata*, *Dosinopsis lenticularis*, *Ostrea compressirostra*, representing a fauna decidedly "Lignitic" in character; while in the upper beds (which may be designated the *Woodstock Stage*), are found *Corbula nasuta*, *C. oniscus*, *Cytherea subimpressa*,

Protocardia virginiana, *Pecten rogersi* and other forms identical or closely related to "Claiborne" types.

I am, therefore, strongly of the opinion, upon both geological and paleontological grounds, that the Eocene deposits of the Middle Atlantic slope represent the greater portion of the Eocene series of the Gulf, its highest members alone excepted. Compared with the section recognized by Prof. E. A. Smith in the Alabama area it undoubtedly comprises the Lignitic, Buhrstone and Claiborne and, possibly, also portions of the White Limestone, although there is little paleontological evidence regarding the equivalency of the latter. Undoubtedly less change in faunal development would be produced under the stable conditions that prevailed in Eocene time in the Middle Atlantic slope than in the Gulf, so that the more highly developed fauna of the upper portion of the series in the latter area may have existed contemporaneously with older forms outside the region. Without a much fuller knowledge of the characteristics of the Eocene fauna in the intermediate district this cannot be definitely determined, although it seems highly probable.

I desire to recognize my obligations to the U. S. Geological Survey for the facilities afforded in the prosecution of this investigation as well as for the opportunity to publish the results under its auspices. The species referred to in the accompanying list have been largely figured, and the plates, together with fuller descriptions of the forms, will be found in the forthcoming government report.

I am also under great obligations to Professor E. D. Cope, Dr. W. H. Dall, Mr. T. W. Vaughan, and Dr. R. M. Bagg for important aid in the work.

DESCRIPTION OF SPECIES.

VERTEBRATA.

REPTILIA.

Thecachampsia marylandica, n. sp.

Tooth with elongate, slightly curved, conic crown; surface with fine, longitudinal striations. Less curved and elongate than *T. sericodon* Cope, but more coarsely striated.

Loc. Clifton Beach, Upper Marlboro, Md.

Euclastes (?), sp.

Fragments of costals, thin, smooth, and with rounded edges.

Loc. Clifton Beach, Md.

Trionyx virginiana, n. sp.

Fragments of costals with characteristic tuberculated surface; pits broad; ridges far apart and irregular.

Loc. Aquia Creek, Va.

PISCES.

Ischyrrhiza (?) *radiata*, n. sp.

Caudal vertebra, with coalesced haemal and neural spines; two precaudal vertebrae elongate, deeply amphicoelous, with delicate neural spines.

Loc. Clifton Beach, Md.

Myliobatis copeanus, n. sp.

Upper dentition strongly arched; dental crowns distinctly striated. Lower dentition relatively flat; median teeth five times as broad as long; lateral teeth slightly longer than wide.

Loc. Clifton Beach, Md.; Aquia Creek, Va.

Carcharodon polygurus, Agassiz.

Loc. Evergreen, Potomac Creek, Va.

Lamna (?) *obliqua*, (Agassiz).

Loc. Aquia Creek, Front Royal, Evergreen, Va.

Oxyrhina hastalis, Agassiz.

Loc. Evergreen, Aquia Creek, Va.

Odontaspis elegans, (Agassiz).

Loc. Ft. Washington, Clifton Beach, Md.; Evergreen, Front Royal, Va.

Galeocerdo contortus, Gibbs.

Loc. Aquia Creek, Evergreen, Va.

ARTHROPODA.

CRUSTACEA.

Cythere, sp.

Numerous minute crustaceans of this genus were found.

Loc. Woodstock, Va.

MOLLUSCA.

CEPHALOPODA.

Nautilus, sp.

Fragments of the shell of an undetermined *Nautilus* are quite common.

Loc. Clifton Beach, Md.

GASTEROPODA.

Tornatella bella, Conrad.

Loc. Pamunkey Neck, Md.

Cylichna venusta, n. sp.

Shell ovate, rather globose; surface spirally striate; spire depressed; columella with small, obscure plait. Dimensions: length, 3 mm.; width, 2 mm.

Loc. Woodstock, Va.; Pope's Creek, Md.

Ringicula dalli, n. sp.

Shell five-whorled; surface of last four whorls strongly striate spirally; spire elevated, acuminate; outer lip much thickened and crenulate within; columella with thick callus and with two strong plaits. Dimensions: length, 3 mm., width, 1.5 mm.

Loc. Woodstock, Va.

Pleurotoma harrisi, n. sp.

Shell elongate, five or six whorled; surface with distinct, revolving lines of varying size, crossed by ridges; aperture narrow, with long, straight canal. Dimensions: length, 22 mm.; width, 7 mm.

Loc. Potomac Creek, Va.

Mangilia (*Pleurotomella*) *bellistriata*, n. sp.

Shell subuniform, with short, pointed spire, five-whorled; surface with numerous alternating spiral threads, crossed by wavy lines and oblique ribs, the latter strongest at the shoulder. Dimensions: length, 25 mm.; width, 12 mm.

Loc. Pope's Creek, Md.

Volutilithes petrosa, Conrad.

Loc. Potomac Creek, Va.

Volutilithes (*Athleta*) *tuomeyi*, Conrad.

Loc. Potomac Creek, Va.

Volutilithes sp.

Loc. Aquia Creek, Va.

Caricella, sp.

Loc. Aquia Creek, Va.

Mitra marylandica, n. sp.

Shell rather thick, six-whorled (?); surface with numerous spiral threads, crossed by fine lines; spire moderately high; aperture elongate; columella nearly straight, with three plaits. Dimensions: length, 20.3 mm.; width, 7 mm.

Loc. Pamunkey Neck, Md.

Mitra, sp.

Loc. Pamunkey Neck, Md.

Pyropsis, sp.

Loc. Crownsville, Md.; Aquia Creek, Va.

Fusus (*Levifusus*) *trabeatus*, Conrad.

Loc. Popes Creek, Md.; Aquia Creek, Va.

Fusus (*Strepsidura*) *perlatus*, Conrad.

Loc. Aquia Creek, Va.

Fusus, sp.

Loc. Aquia Creek, Va.

Fulgur argutus, n. sp.

Shell four or five-whorled; later whorls with spinous tubercles at shoulder; body whorl also with two lower rows of tubercles, 10 to 14 in each row; canal rather long, narrow.

Loc. Potomac Creek, Va.; Pamunkey Neck, Md.

Calyptrophorus jacksoni, n. sp.

Shell large, solid, many whorled; spire prolonged, acuminate; surface of adult covered with thick, calcareous deposit, entirely enveloping the whorls; inner lip thickened with extensive callosity. Dimensions: length, 75 mm.; width, 30 mm.

Loc. South of Annapolis, Md.

Lunatia marylandica, Conrad.

Loc. Ft. Washington, Md.; Potomac Creek, Front Royal, Evergreen, Va.

Natica cliftonensis, n. sp.

Shell small, four or five whorled; spire low; body whorl much inflated; aperture large, with thick callus. Dimensions: length, 10 mm.; width, 12 mm.

Loc. Clifton Beach, Md.

Turritella mortoni, Conrad.

Loc. Ft. Washington, Upper Marlboro, Clifton Beach, Md.; Aquia Creek, City Point, Va.

Turritella humerosa, Conrad.

Loc. Ft. Washington, Clifton Beach, Md.; Aquia Creek, Va.

Calyptraea trochiformis, Lamarek.

Loc. Ft. Washington, Clifton Beach, Md.; Aquia Creek, Va.

Vermetus, sp.

Loc. Piscataway Creek, Md.; Aquia Creek, Va.

Scala virginiana, n. sp.

Shells, seven or eight whorled (?); varices, 15 to each whorl, inflected forward and prominent, crossed by numerous, uniform, fine spiral striae; aperture, nearly round. Dimensions: length of five whorls, 20 mm.; diameter largest whorl, 15 mm.

Loc. Aquia Creek, Va.

Solarium, sp.

Loc. Aquia Creek, Va.

Gibbula glandula, (Conrad).

Loc. Potomac Creek, Va.

SCAPHOPODA.

Cadulus bellulus, n. sp.

Shell moderate size, polished, slightly arched; much contracted near the anterior extremity; anterior opening subcircular, posterior simple. Dimensions: length, about 10 mm.; width, 2 mm.

Loc. Woodstock, Hanoverville, Va.

PELECYPODA.

Teredo virginiana, n. sp.

Tube cylindrical, long, irregularly curved; surface smooth; prominent, transverse partition near posterior extremity.

Loc. Many places in Maryland and Virginia.

Gastrochaena, sp.

Loc. Aquia Creek, Va.; Upper Marlboro, Md.

Pholas (?) *petrosa*, Conrad.

Loc. Ft. Washington, Md.; Aquia Creek, Va.

Coralliophaga bryani, n. sp.

Shell transversely oblong, thin, slightly gaping posteriorly, prominent fold from umbo to lower margin; surface with delicate lines of growth and fine radial rows of minute granules, obsolete over much of the surface; teeth, two small cardinal and one long posterior lateral; pallial line with shallow sinus.

Loc. Pamunkey Neck, Md.

Solemya petricoloides (Lea).

Loc. Woodstock, Va.

Corbula nasuta, Conrad.

Loc. Woodstock, Va.

Corbula oniscus, Conrad.

Loc. Woodstock, Front Royal, Evergreen, Va.

Corbula aldrichi, Meyer.

Loc. Evergreen, Hanoverville, Front Royal, Va.

Tellina virginiana, n. sp.

Shell thin, posteriorly short, angular and slightly folded, anteriorly rounded and elongate; two small cardinal teeth and indistinct lateral teeth; pallial sinus obscure; surface with fine concentric lines. Dimensions: length, 15 mm.; height, 10 mm.

Loc. Hanoverville, Aquia Creek, Va.; Ft. Washington, Md.

Tellina williamst, n. sp.

Shell small; surface with elevated, close set ridges or lamellae, increasing in size downward; posteriorly subangulate; two cardinal teeth, posterior bipid; lateral teeth strongly developed; pallial sinus deep. Dimensions: length, 8 mm.; width, 5 mm.

Loc. Potomac Creek, Va.

Cytherea ovata, Rogers.

Cytherea pyga, Conrad, and *C. liciata*, Conrad, are regarded as synonyms.

Loc. Ft. Washington, Glymont, Clifton Beach, Md.; Aquia Creek, Potomac Creek, Front Royal, Evergreen, Va.

Cytherea eversa, Conrad.

Loc. Hanover Co., Va.

Cytherea subimpressa, Conrad.

Loc. Pope's Creek, Md.; Woodstock, Hanoverville, Va.

Dosiniopsis lenticularis (Rogers).

Dosiniopsis meekii, Conrad, is simply a solid variety of Rogers' species.

Loc. Ft. Washington, Glymont, Clifton Beach, Md.; Aquia Creek, Potomac Creek, Va.

Panopaea elongata, Conrad.

Loc. Ft. Washington, Winchester, Md.; Aquia Creek, Va.

Pholadomya marylandica, Conrad.

Loc. Ft. Washington, Md.; Aquia Creek, Va.

Lucina aquiana, n. sp.

Shell somewhat compressed; surface with numerous concentric striae; lunules deeply incised; anteriorly elongate; posteriorly rounded; hinge with two cardinal and two lateral teeth. Dimensions: length, 18 mm.; height, 18 mm.

Loc. Aquia Creek, Va.

Lucina whitei, n. sp.

Shell small, globose; surface with prominent concentric lamellae, interrupted posteriorly by shallow fold; anterior side rounded; posterior angulated; margin erenulate. Dimensions: length, 4 mm.; height, 3.5 mm.

Loc. Woodstock, Hanoverville, Va.

Lucina uhleri, n. sp.

Shell small, orbicular; surface with numerous, uniform, elevated, concentric ridges; anterior and posterior sides rounded; interior with radiating striae; margin simple. Dimensions: length, 5 mm.; height, 4 mm.

Loc. Woodstock, Va.

Lucina dartoni, n. sp.

Shell small, suborbicular, thin; surface with fine distant, concentric lamellae, crossed by fine, irregular radial lines; anteriorly and posteriorly high-shouldered and angulated; lunules large; hinge area narrow; muscle impressions shallow; margin simple. Dimensions: length, 7 mm.; height, 5.5 mm.

Loc. Woodstock, Va.

Diplodonta hopkinsiensis, n. sp.

Shell small, suborbicular, globose; surface with fine, indistinct striations; anteriorly and posteriorly rounded. Dimensions: length, 9 mm.; height, 8 mm.

Loc. Evergreen, Va.

Astarte marylandica, n. sp.

Shell small, roundedly trigonal, somewhat compressed, thick, nearly equilateral; surface concentrically costated, with superimposed fine striae; umbones prominent. Dimensions: length, 16 mm.; height, 15 mm.

Loc. Upper Marlboro, Md.

Venericardia planicosta, Lamarek.

Under this species is placed *Venericardia ascia*, Rogers, and *V. regia*, Conrad.

Loc. Sassafas River, Severn River, South River, Ft. Washington, Pope's Creek, Md.; Aquia Creek, Potomac Creek, Woodstock, Front Royal, Evergreen, Va.

Protocardia virginiana, Conrad.

Loc. Pope's Creek, Md.; Woodstock, Va.

Crassatella alaeformis, Conrad.

Crassatella capri-cranium, Rogers, and *C. declivis*, Heilprin, are undoubtedly slight varietal forms of *C. alaeformis*.

Loc. Ft. Washington, Glymont, Clifton Beach, Md.; Aquia Creek, Potomac Creek, City Point, Va.

Crassatella aquiana, n. sp.

Shell moderately large, attenuated posteriorly; surface with few, broad, shallow, concentric furrows, and numerous fine concentric lines, often obscure; lunules broad, deeply depressed. Dimensions: length, 45 mm.; height, 35 mm.

Loc. Aquia Creek, Va.

Nucula magnifica, Conrad.

Loc. Woodstock, Hanoverville, Va.

Leda parva, (Rogers).

Loc. Woodstock, Evergreen, Va.

Leda improcera, (Conrad).

Loc. Woodstock, Pamunkey River, Va.

Leda protecta, (Conrad).

Loc. Front Royal, Potomac Creek, Va.

Yoldia cultelliformis, (Rogers).

Loc. Pope's Creek, Md.; Woodstock, Evergreen, Va.

Pectunculus idoneus, Conrad.

Loc. Upper Marlboro, Md.; Woodstock, Va.

Cucullaea gigantea, Conrad.

Cucullaea onochela, Rogers, *C. transversa*, Rogers, and *C. idonea*, Conrad, are regarded as synonyms.

Loc. Severn River, Ft. Washington, Clifton Beach, Md.; Aquia Creek, Potomac Creek, Evergreen, Va.

Modiola potomacensis, n. sp.

Shell small, oblong, thin, tumid, anteriorly contracted; surface with fine costated striae, nearly obsolete anteriorly, crossed by irregular lines of growth; umbones prominent, curved. Length transversely, 14 mm.

Loc. Pope's Creek, Md.; Potomac Creek, Woodstock, Pamunkey river, Va.

Pecten rogerst, n. sp.

Shell small, orbicular, subpellucid, nearly equilateral, thin; surface shining, with fine, delicate, concentric lines, and rather obscure, radial ribs. Dimensions: length, 16 mm.; height, 18 mm.

Loc. Potomac Creek, Front Royal, Va.

Pecten johnsoni, n. sp.

Shell small, suborbicular, equilateral; surface with about 20 uniform distant, rounded costae, and a few short costae in interspaces near basal margin, the whole crossed by fine lines of growth. Dimensions: length, 14 mm.; height, 15 mm.

Loc. Potomac Creek, Va.

Pecten, sp.

Loc. Potomac Creek, Va.

Anomia mcgeei, n. sp.

Shell of left valve rather solid, convex, nearly equilateral; surface strongly lamellar, with faint radial plaits, stronger in the later than the earlier portions of the shell. Dimensions: length, 50 mm.; height, 48 mm.

Loc. Hanover Co., Va.

Ostrea compressirostra, Say.

Loc. Severn River, Crownsville, Ft. Washington, Glymont, Clifton Beach, Md.; Aquia Creek, Front Royal, Evergreen, Va.

Ostrea sellaeformis, Conrad.

Loc. Glymont, Md.; Aquia Creek, Potomac Creek, Hanoverville, Evergreen, Va.

Ostrea, sp.

Loc. Glymont, Md.; Aquia Creek, Va.

Ostrea, sp.

Loc. Clifton Beach, Md.; Aquia Creek, Va.

VERMES.

Serpula, sp.

Portions of *Serpula* tubes are common in many localities in Maryland and Virginia.

ECHINODERMATA.

ECHINOIDEA.

Fragments of species of a Diadematoïd species from Potomac Creek and plates of a Spatangoid form from Evergreen, Va., were found, but generic determinations are not possible.

COELENTERATA.

By T. WAYLAND VAUGHAN.

ANTHOZOA.

Paracyathus (?) *clarkeanus*, n. sp.

Corallum conical, usually slightly curved. Cross-section elliptical. Nearly always showing a distinct area of detachment, which is variable in size. Costæ not very prominent; forty-eight in number, corresponding to all the cycles of the septa; nearly equal in size, in young specimens those corresponding to the last cycle of septa are smaller than those earlier developed. No epitheca was observed, and is most probably absent. Septa thin, not projecting beyond the upper margin of the corallum wall, sides granulated; forty-eight in number, arranged in six systems of four cycles each; those of the first three cycles reach the columella; the fourth cycle fuse by their inner margins to the sides of the third cycle. Calicular fossa shallow. Pali apparently before all of the cycles of the septa except the last, small and thin, difficult to distinguish from the papillate upper surface of the columella. Rudimentary dissepiments apparently present. Columella fascicular; upper surface papillate.

The measurements of two specimens are:

Greater diameter of calice,	- - - -	7 mm.	7.75 mm.
Lesser diameter of calice,	- - - -	6 mm.	5.5 mm.
Height of corallum,	- - - -	12.5 mm.	9.75 mm.

Loc. Potomac Creek, Aquia Creek, Va.

Turbinolia acuticostata, n. sp.

Conical in shape as is usual in the genus, size small. Costæ tall and thin with irregular margins. Beginning with six, six more are soon developed, making twelve, between which in the intercostal furrows are double rows of perforations. From the base the twelve-costal condition exists for about one-sixteenth of an inch, when twelve more costæ are introduced. The costæ on the basal portion of the corallum are very slightly larger than they are on the upper portion; they are not so prominent on the basal portion as in *Turbinolia pharetra*. In the extreme upper portion twenty-four more small costæ are introduced, making the total number forty-eight, twice as many costæ as septa. In the intercostal furrows, after the development of the forty-eight costæ, there are only single rows of perforations; during the twenty-four costal stage there are double rows of alternating perforations in the intercostal furrows. The septa are twenty-four in number, in three cycles. Those of third cycle fuse, about half-way between the corallum wall and the columella, by their margins to the sides of the septa of the first cycle. Their sides are beset with distant sharp, small spines. All of the septa except those of the first cycle are thin and weak. Columella probably pillar like, without a star as in *T. pharetra*, but the specimens are too much broken to enable one to decide positively. Height, 6.5 mm.; diameter of calice, 3 mm.

Loc. Potomac Creek, Va.

Eupsammia elaborata, Conrad.

Loc. Aquia Creek, Potomac Creek, Va.

Eupsammia (?) *pileolus*, Conrad.

Loc. Kent Co., Va.

PROTOZOA.

By R. M. BAGG.

FORAMINIFERA.

Spiroplecta clarki, n. sp.

Test elongate, textulariform, finely arenaceous and firmly cemented; compressed strongly, lateral margins sharp and very slightly lobed; surface of shell rough, of a dull gray color; chambers at first planospiral then arranged biserially with nine or ten respectively upon each side; aperture, a median arched opening. Dimensions: length, 0.53 mm.; width, 0.2 mm.

Loc. Woodstock, Va.

Nodosaria affinis, d'Orbigny.

Loc. Woodstock, Va.

Nodosaria bacillum, DeFrance.

Loc. Woodstock, Va.

Nodosaria communis, d'Orbigny.

Loc. Sunnyside, Md.

Nodosaria farcimen, (Soldani).

Loc. Pamunkey River, Va.

Vaginulina legumen, (Linné).

Loc. Sunnyside, Md.

Cristellaria radiata, Reuss.

Loc. Woodstock, Va.

Polymorphina amygdaloides, (Reuss).

Loc. Pamunkey River, Va.

Polymorphina austriaca, d'Orbigny.

Loc. Woodstock, Va.

Polymorphina communis, d'Orbigny.

Loc. Woodstock, Pamunkey River, Va.

Polymorphina complanata, d'Orbigny.

Loc. Pamunkey River, Va.

Polymorphina compressa, d'Orbigny.

Loc. Woodstock, Va.

Polymorphina elegantissima, Parker and Jones.

Loc. Woodstock, Va.

Polymorphina gibba, d'Orbigny.

Loc. Woodstock, Va.

Polymorphina praelonga, Terquem.

Loc. Woodstock, Va.

Globigerina bulloides, d'Orbigny.

Loc. Woodstock, Va.

Discorbina bertheloti, d'Orbigny.

Loc. Woodstock, Va.

Truncatulina lobatula, (Walker and Jacob).

Loc. Woodstock, Va.

Pulvinulina elegans, (d'Orbigny).

Loc. Pamunkey River, Va.

Pulvinulina schreibersii, (d'Orbigny).

Loc. Woodstock, Va.

Nonionina affinis, Reuss.

Loc. Woodstock, Va.

Nonionina depressula, (Walker and Jacob).

Loc. Pamunkey River, Va.

Amphistegina lessonii, d'Orbigny.

Loc. Woodstock, Va.

A few specific names are omitted from the list of Eocene forms reported from the Middle Atlantic slope either on account of the fragmentary nature of the types, as in the case of *Crassatella palmula*, Conrad, and *Nucula parilis*, Conrad, or lack of any description, as in *Ostrea subeversa*, or finally on account of derivation from another formation, as in *Anomia ruffini*, Conrad, which is undoubtedly a Miocene species.

Additional Observations upon the Miocene (Chesapeake) Deposits of New Jersey. By WILLIAM B. CLARK.

The occurrence of extensive deposits of Miocene age throughout eastern New Jersey was first described by the writer in the Annual Report of the State Geologist for 1892, and again in the Report for 1893, when the identity of the strata with the Chesapeake formation farther south was claimed. A later paper was presented at the Baltimore Meeting of the Geological Society of America in December, 1894, in which the marginal features of the formation were described.

Although some of the earlier reports of the State Survey and a few special articles contain references to the pre-Pleistocene age of a portion of these beds, it is evident that the stratigraphical relations of the deposits were not understood, while little attempt was made to indicate their areal extent.

As the result of detailed mapping on the part of the writer and his assistants however, it has been possible to satisfactorily determine the relations of the Miocene strata throughout the State, and to prove the identity of the gravels, sands and clays in the northern portion of the area, with the sands, clays and fossiliferous marls in the southern, while the examination of the intervening region has shown the direct continuation of these deposits into the already described Chesapeake formation of the Middle Atlantic slope.

In his exhaustive studies of the late Tertiary and Pleistocene of New Jersey, Professor Salisbury has recently employed the name "Beacon Hill formation" for the gravels and sands occurring in the northern portions of the district. These together with the clays and marls associated with them have been traced as above mentioned into the Chesapeake strata farther south.